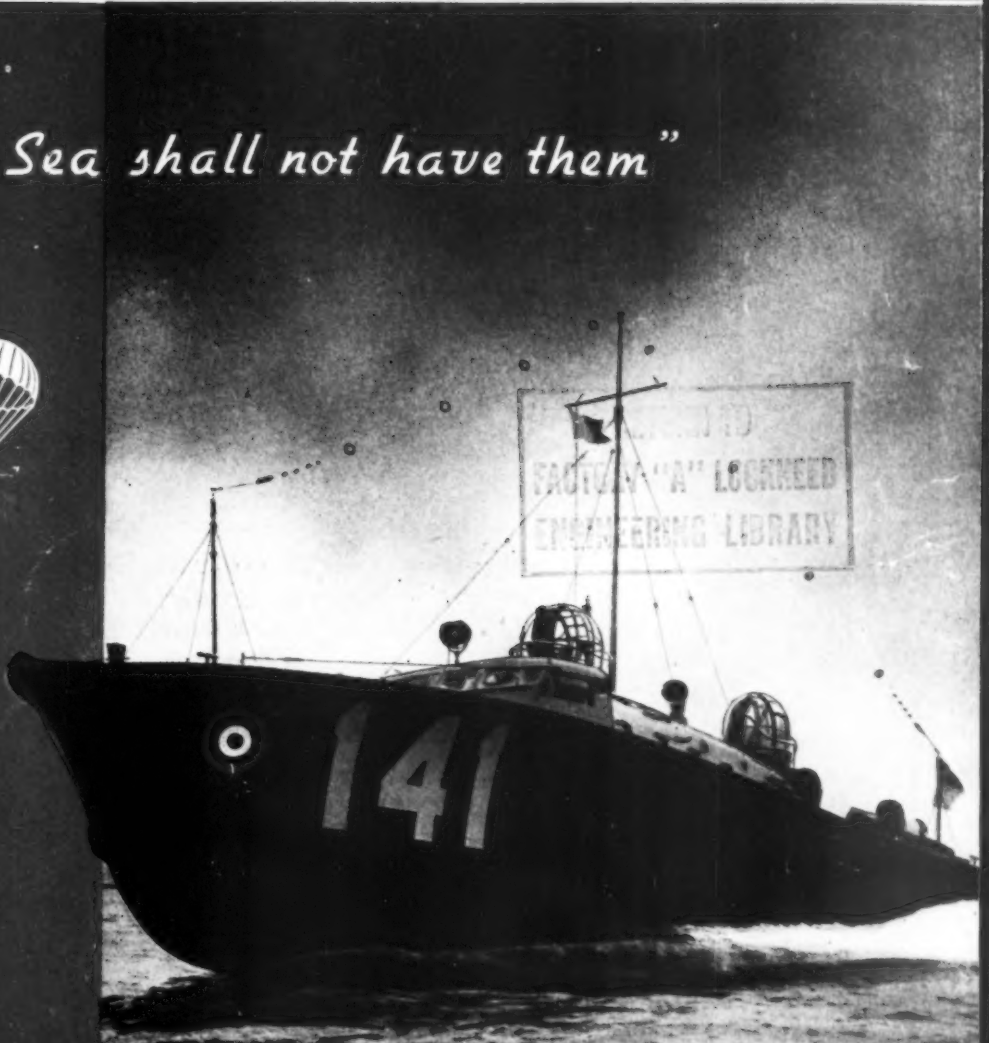
1932
XLV

FLIGHT

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB FEBRUARY 3rd, 1944

"The Sea shall not have them"



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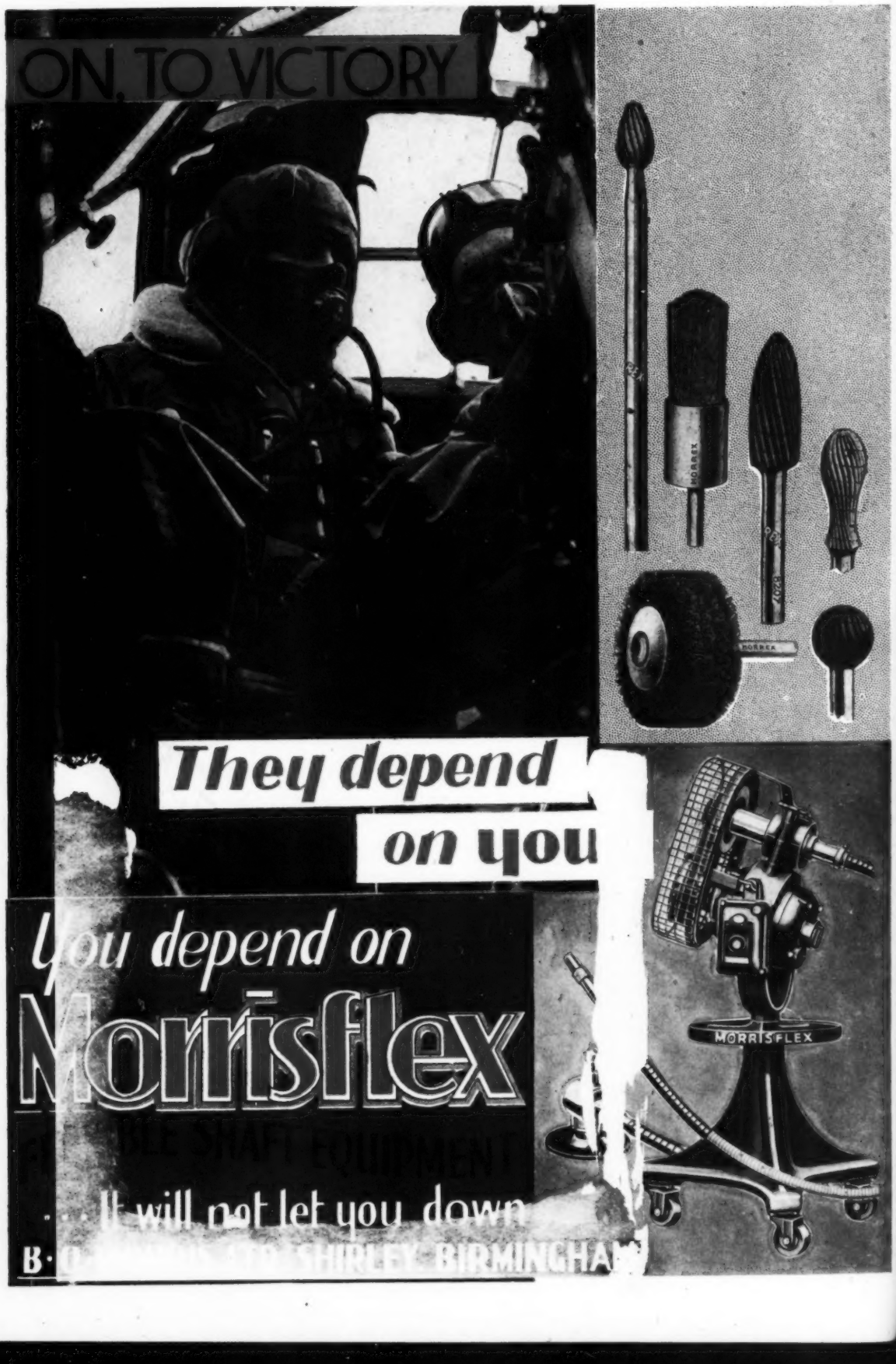
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FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Technical Training

FEW problems are of more importance to post-war aviation than that of technical training; consequently we make no apology for reverting to the subject again this week, especially in view of the fact that we publish in this issue an article by a young man who has just completed his aeronautical training and is now employed by one of our large aircraft firms. He is continuing his studies as a student member of the Institution of Production Engineers, and his remarks bear some evidence of his preference for this particular aspect of engineering, although most of what he has to say is equally applicable to other branches.

We are very glad to publish the views of the younger generation which have not, so far, we feel, been given due consideration. Having just completed his "swatting," our contributor writes feelingly when he says that "the human mind can absorb only a certain amount, and we have not developed into a race of 'supermen' . . ." That being granted, what is the solution? Should the student and apprentice specialise at an early stage, or should they try to absorb "a little of everything"?

The article examines the problem and makes the suggestion that the student should be made to adopt neither of these two extremes, but that he should study the particular aspects of all those branches of engineering which are related to the function which he has selected for his career. Both the design student and the production engineer are interested in "costing," but from different aspects.

There is a great deal of sound sense in our contributor's argument, and it would be interesting to have the views of others on the subject, and our columns are open to advocates of "Specialist" and "Generalist" alike.

Whence the Chiefs?

THE foregoing considerations relate to the beginnings of a career in aircraft engineering. But what of the other end of the scale? Whence will come the men to replace our present generation of chief designers? With few exceptions these men have grown up with flying from its very beginning. They have borne the brunt of the struggle for more than 30 years. The time is coming when their successors will have to be found, and the post is one of tremendous responsibility.

Mr. Sydney Camm is fond of saying that the chief "has to be a decider rather than a designer." There is a profound truth in that epigram. In all branches of engineering there is need for compromise, but nowhere more so than in aircraft design, which is from beginning to end a compromise between conflicting and antagonistic demands. The most successful designer is he who can select out of the almost unlimited combinations possible that which will give either the best all-round results or that which places the emphasis in the right place so that excellence in one or two respects is achieved without sacrificing too much in other directions.

Much has been made of the marvellous research and educational establishments of such countries as Germany and the United States, and many people in this country are worried, and quite rightly so, about the way in which Great Britain is lagging behind in this respect. But do not let us overlook the fact that, in spite of this, British designers have produced aircraft at least the equal of any in the world, and in a good many cases definitely superior. Not the least successful have been produced by firms which do not even have a wind tunnel. As examples may be mentioned Hawker and De Havilland.

We believe that if all the facts were available and the

reason could be evaluated, it would emerge that the explanation is to be found in the chief designer's ability to "decide." That his task may be made somewhat lighter by the availability of many test results, structural and aerodynamic, will be granted, but in the end the human element, in the person of the chief designer, is the most important single factor.

Just how many decisions a designer may have to make, almost simultaneously, is well illustrated by the experience of the Hawker team. While the Hurricane was being designed, the Henley and the Hotspur family were being designed and produced. These were followed almost immediately by the Typhoon and Tornado, as well as the Hurricane II, which was produced during the Battle of Britain. We shudder to think of the number of decisions which Mr. Camm must have had to make during that period in the design of such different types, each with its own functions and peculiarities. Other firms have had similar experiences.

One is almost driven to the conclusion that to be successful as a chief designer in the future, a man must be something of a "superman." Certainly the "specialist" will stand little chance of being in a position to weigh the pros and cons of every compromise. And the "generalist" will be handicapped by the fact that his inadequate knowledge of numerous subjects will place him too much at the mercy of his subordinates, the persuasiveness of one of whom might lead to a choice which is not the best in the overall compromise.

A Heavy Week-end

THE air offensive over the Continent grows in intensity. On last Saturday and Sunday, counting attacks by both night and day, over 200 German machines are reported to have been destroyed by the Allies, while their losses amounted to 124.

In losses of personnel, in the money value of the aircraft destroyed, and in the man-hours needed to build them, the advantage is heavily on the side of the Germans. Their losses were fighters, small machines and many of them single-seaters, while the bulk of the Allied losses was in heavy bombers. Such calculations, however, are misleading—just one more example of how figures can be made to prove anything if duly manipulated. No attacks would ever be delivered if the attacking commander indulged in that sort of arithmetic. General Spaatz put the matter in the correct light when he said that he expected heavier casualties in the future, but intended to face them because that would help to get the job finished more quickly. To end the war by victory as soon as possible must reduce the total of losses to the victors—including the starving peoples of the occupied countries.

These latest raids have been notable for several features. They have stressed once again the value of the Pathfinder Force, about which an article appears on another page; they have demonstrated the immense growth of the U.S. Army Air Force in Britain, and they have also shown the value of the long-range Mustang as an escort fighter.

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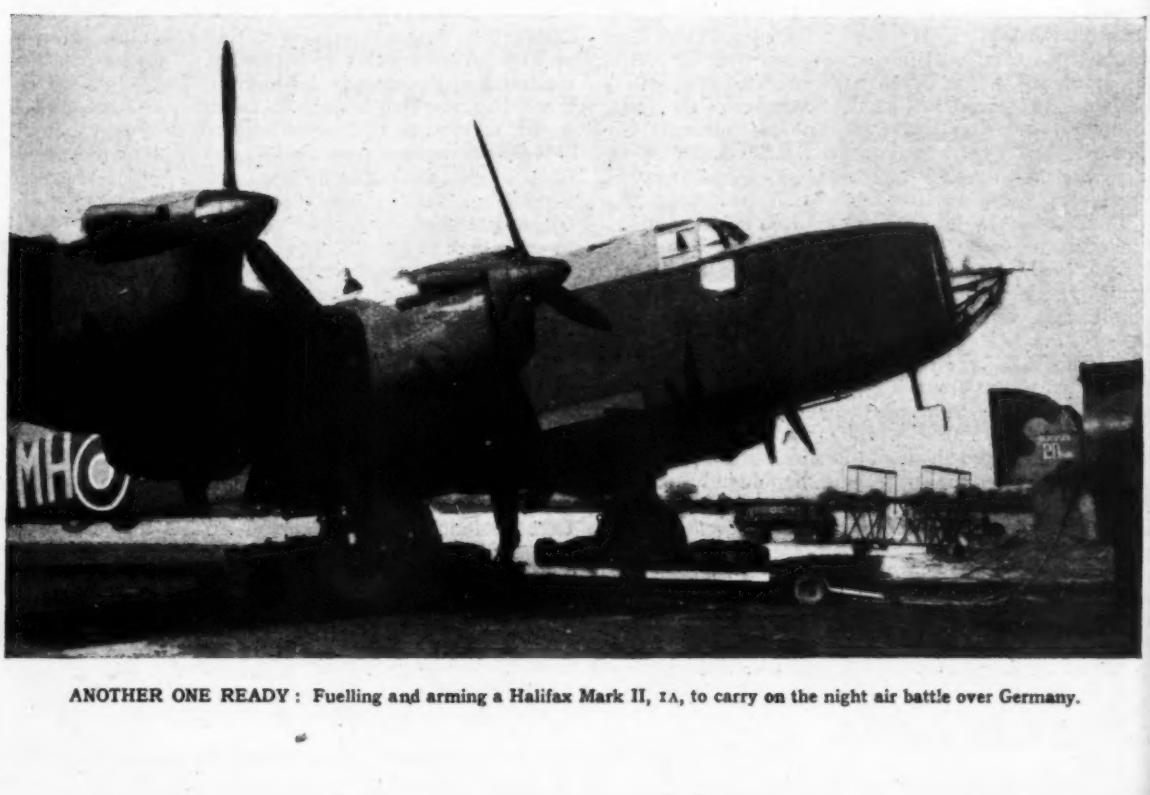
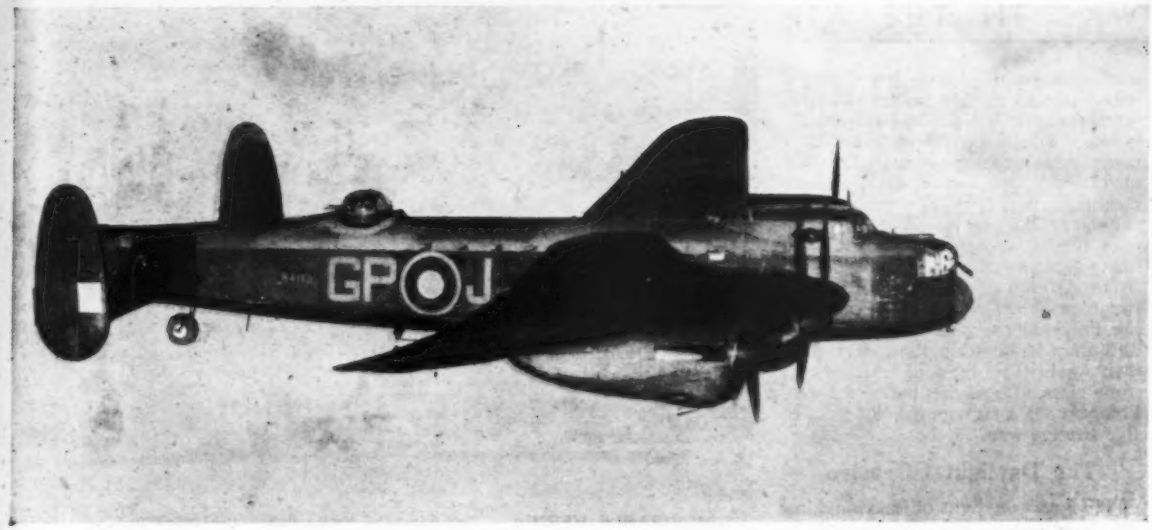


ANOTHER ONE READY: Fuelling and arming a Halifax Mark II, 1A, to carry on the night air battle over Germany.



The Avro Lancaster which is acknowledged to be the finest heavy bomber used by any of the belligerents.

WAR in the AIR

Results of Air Supremacy : Aircraft Helping U-boats : North France Hammered Daily

SELDOM has air supremacy, asserted in advance, had a more striking effect on a battle than in the case of the Fifth Army landing round Anzio. The long delay of the Germans before they were able to offer any considerable resistance to our troops is testimony to the way in which their airfields and ground communications had been interfered with by the Mediterranean Air Force.

The contrast between the number of sorties flown by the *Luftwaffe* and the M.A.C. is striking, but was only to be expected. The Germans have evidently accepted the position that their armies in Italy must go short of air support, because they have so many commitments elsewhere. Then the preliminary bombing of their airfields round Rome and elsewhere would limit their ability to send aircraft against the landing area. The constant patrol by Allied fighters also discouraged the Germans from doing much in the air. Those fighter patrols, calling for frequent reliefs, sent up the tale of Allied sorties to staggering figures. The Germans dare not risk large-scale air battles by day, and so what efforts they made were mostly by night. It was typical of the modern Hun that his night-bombers should select the easy prey of hospital ships, which were well lit up. They sank the *St. David* and damaged some others, but fortunately the loss of life was not heavy.

As a proof of the straits to which the Germans were reduced, some of the bombing attacks delivered at Anzio were made by machines which started off from bases in France. It is also reported that the Germans have recalled squadrons from as far away as Bordeaux to bolster up their air strength in Italy. Some of their airfields along the Riviera had been visited by our bombers in the preliminary operations, but naturally they would not constitute a primary target.

UNBALANCED : Wing Cdr. Woods, D.F.C. and Bar, examining a blade of his D.H. airscrew which had been hit by ground flak. Despite the vibration he took his Spit IX on to shoot down a Ju 87.

By day the Germans hardly dare to move supplies or reinforcements by road or rail, for fear of the medium bombers and fighter-bombers of the Allies, but they do manage to get men and materials through by night. It is always difficult to put railways and roads permanently out of action by bombing or shelling—and the Navy has also been busy on the German lines of communication, shelling them at various points. So roads and railways can be used by the enemy by night, though he cannot get through anything like the quantity that he would like when movement is confined to the hours of darkness.

New Tactics in the Atlantic

IT begins to look as if the Germans have realised that the U-boat, on which so many hopes were based, is not going to starve Britain into submission. The use of the Azores has very much strengthened the hands of Britain and the United States in protecting the convoys. So the Germans, short of aircraft as they are on all

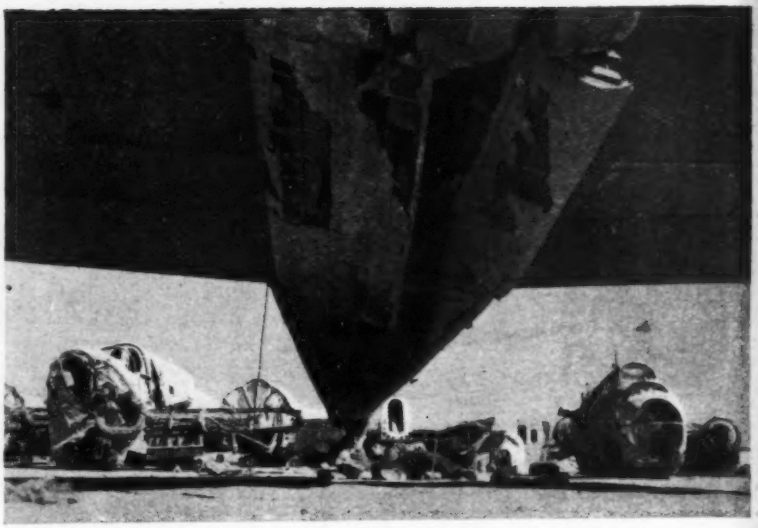
WAR IN THE AIR

fronts except the West, have turned once more to air attacks on the convoys when the U-boats have obviously failed. The aircraft which the Germans send out from bases on the Bay of Biscay are necessarily heavy machines, and they have to risk encounters with the interceptor fighters from the escort carriers. For them the heavy German machines would be just so much cold meat. But the long-range machines of Coastal Command are only too eager to act as fighters, and they have more than held their own against German aircraft of the same class. Dog-fights between heavy bombers are a strange development of this strange war.

The Daylight Offensive

THE great daylight offensive against targets in northern France and the Low Countries goes on day after day without intermission, and with a minimum of opposition by German fighters. The casualties on both sides are small, and it is clear that it is deliberate policy on the German part not to engage in air combat. In that part of Europe at least the Germans are not short of fighters, though the prospects of replacing losses may well be dubious. If Gen. Spaatz was correct in his estimate that recent raids on enemy fighter factories have cut down the planned German production by 40 per cent., then there is an obvious reason why the Germans should not risk losses except for the defence of some place which they consider of vital importance.

In that part of France there must be many places which the Germans are very loth to see damaged. It is a heavily fortified slice of Europe, for the Germans do not know any more than the Editor of *Flight* does whether it will be the place selected for an Allied invasion. It must be teeming with German troops, both those manning the coast defences and also mobile units. There may also be so-called "secret weapons" in the area, which the enemy would not like to see bombed out of existence.



HONOURABLE HERNIA: The damaged bomb doors and fuselage of a Bristol Beaufort after making a wheels-up landing.

Of late the communiqués have been vague about the targets which the British and American medium bombers have been attacking so relentlessly, though many personal reports have emphasised the great accuracy with which the bombs have been dropped on them. The main defence has been only *flak*. That has been heavy, but it has not stopped the Allied airmen, and it has not brought down many of them. Defensive fighters only appear on rare occasions, and when they do the escorts of Spitfires and Typhoons deal with them. The situation is interesting, and it does not suggest any great confidence on the part of the German High Command that they will be able to win the war.

Another strange new weapon has been used by German ships attacked by Coastal Command aircraft off Norway. It was described as a sort of parachute projectile. It was fired from a gun, and at the end of its travel a parachute opened, presumably with some sort of shell dangling from it. It does not sound a very efficient weapon for repelling aircraft attacks, but at the present time the Germans are giving a lot of attention to turning out strange weapons. The glider bombs used in the latest attack on a convoy seem to have caused more amusement to our airmen than damage to the shipping. Bombs trailed by fighters have been used against American heavy bombers. They sound a more unpleasant device, but, as General Spaatz has said, they will not stop the Americans from pushing on with their daylight attacks. Heavier losses may be expected in the future, but they will be faced, for the very good reason that the sooner the war is won the smaller will be the total of Allied casualties.

All the Allies are rejoicing over the splendid victory by which the Russians have brought the siege of Leningrad to an end. No longer will that devoted city have to endure the indiscriminate shelling from German

RECOGNITION PROBLEM: A captured Fieseler Storch observation aircraft used by the Allies in Italy. In the background is a Stinson Vigilant.

ENEMY AIR LOSSES TO JAN. 29th

	Over G.B.	Continent	Middle East	Italy
Jan. 23 ...	0	4	0	11
" 24 ...	0	3	0	15
" 25 ...	0	0	0	11
" 26 ...	0	0	0	3
" 27 ...	0	11	6	50
" 28 ...	0	6	0	36
" 29 ...	3	4	0	4
	3	28	6	130

Totals : West, 7,925 ; Middle East, over 5,766 ; N.W. Africa and Italy, 4,174.

heavy artillery which has done so much damage. Correspondents have mentioned the help given by the Red Air Fleet in the battles which led up to the liberation of the city, but, as is usual with the Russians, the official communiqués have given little credit to their air arm. It is the artillery which has received the greatest degree of praise. The communiqué issued on January 27th, the day on which General Govorov announced the end of the siege, curtly stated that on the previous day 16 enemy aircraft were shot down on all fronts. That means that the *Luftwaffe* cannot have been very active on any front, and the Stormoviks must have had things very much their own way in their attacks on German positions.

In the meantime some instructive figures have been made public in the United States, which bode ill for Germany and Japan. It was stated that there are now more than 2,300,000 officers and men in the U.S. Army Air Force, including over 100,000 pilots. This takes no account of the American Naval Aviation, which has also been growing to a formidable size. The latter has now taken over the American share in the Battle of the Atlantic from the Army Air Force, and it is also in training for large-scale carrier work in the Pacific.

It is welcome news that Air Marshal Sir Arthur Coningham has been appointed A.O.C., No. 2 Tactical Air Force of the R.A.F. based in Great Britain. His work in directing No. 1 Tactical Air Force in the Mediterranean has shown him to be a master of this novel form of air work.

The Royal Air Force Regiment, which sometimes feels itself rather out in the cold when there is fighting in which it is not allowed to take part, has been given an important task in Italy. Detachments have been detailed to lay smoke flares and other visual signals out in front of the Eighth Army, thus converting what is called the "bomb line" into something which the air observers can actually see as they fly to the attack.

FLYING KAYAK : Paddling a Walrus from H.M.S. *Belfast* to its pick up position in an Iceland Fjord.

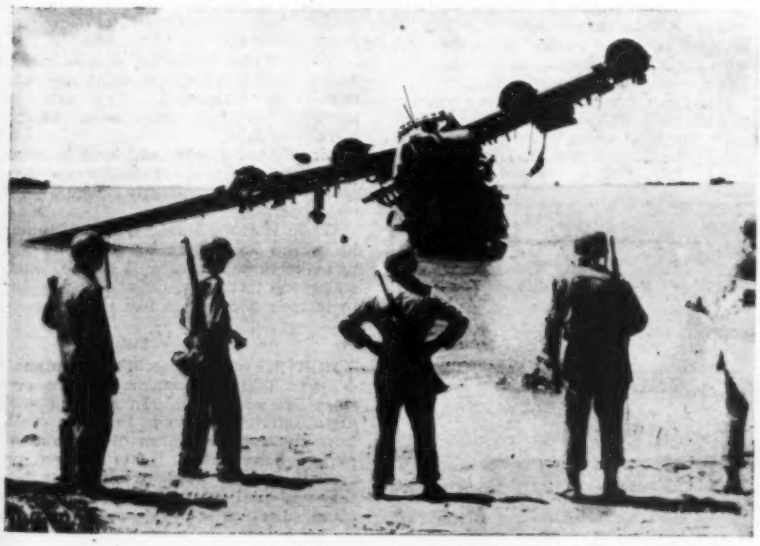
BRITISH & U.S. AIR LOSSES TO JAN. 29th

	Over G.B. A'crft.	Continent B'brs. F'ters.		Middle East A'crft.	Italy
Jan.					
23	0	1	1	2	3
24	0	2	11	0	11
25	0	0	2	0	3
26	0	1	0	1	2
27	0	34	0	0	7
28	0	47	9	0	5
29	0	31	20	0	1
	0	116	43	3	32

Totals : West, 9,508 ; Middle East, about 2,348 ; N.W. Africa and Italy, 1,569.

Bomber Command has continued the Battle of Berlin, with marked success. The U.S. Eighth Air Force has expanded its daylight operations to an impressive scale. Over 800 of its heavy bombers flew to Frankfurt on Saturday, escorted all the way there and back by long-range Mustangs. On Sunday the same Command sent raids to Brunswick and Hanover.

The Germans reply by sending fairly frequent night raids across the Channel to the south-east of Britain and the London area. Ninety bombers is quite an unusually large number for one of these raids. Almost invariably the raiders scatter, distributing their efforts. The principle of concentration has been utterly discarded.



NON-FLYING FORTRESS : A Japanese flying boat which was wrecked during the attack on Makin Island. Although it was out of commission the Japanese used it as a multiple machine-gun post.

"JETS" IN ACTION SOON

JET-PROPELLED fighter squadrons are now being formed and will go into action later this year, according to the American journal *Iron Age*, says a Reuter message from Washington.

Their first operational use, it adds, will be as interceptors behind the Allied lines, owing to their fast rate of climb but short range; this will also prevent any falling into enemy hands should they be shot down.

Ultra long-range fighters, powered by the new two-stage, two-speed supercharged Allison engine, are also in production at General Motors, and are intended as escorts for the new B-29 "Super Fortress" bombers.

HERE AND THERE

U.S. Night-fighters Fly "Beaus"

AMERICAN night-fighter squadrons in Italy have recently been equipped with Bristol Beaufighters and have already brought down a useful number of Huns.

Sir Richard Fairey

THE Institute of Aeronautical Sciences has conferred an honorary Fellowship on Sir Richard Fairey, Director-General of the British Air Commission in America.

Goldfields !

LORD PORTAL, Minister of Works, recently stated that £600,000,000 worth of airfields had been constructed in Great Britain since war began. He was giving examples of the wartime achievements of the building industry.

R.A.F. Association

THE headquarters of the Royal Air Force Association (Old Comrades) has now moved from its previous address at 10, Norfolk Street, Strand, to new premises at 105a, Gloucester Road, London, S.W.7, and the telephone number is now Frobisher 7433.

U.S.A.A.F. Strength

THE American Air Force now numbers more than 2,300,000 officers and enlisted men, according to a statement by the U.S.A.A.F. Training Command.

These figures include 100,799 pilots, 20,086 bombardiers, 18,805 navigators, 107,218 air gunners and 555,891 ground and air-combat technicians.

Brazilian Aircraft Engines

THE new national aircraft-engine factory in Brazil is expected to start production on April 19th, birthday of President Vargas, according to a statement by Gen. Antonio Guedes Muniz, of the Brazilian Air Force, who is in charge of the Government factory.

Last year, it may be recalled, the Brazilian Government entered into an agreement with the U.S. Government by which they were to manufacture Ranger engines, up to 200 h.p., under licence.

Trained in Canada

MORE than 50,000 aircrew personnel, enough to man over 15,000 aircraft, have qualified in Canada under the British Commonwealth Air Training Scheme, it is announced by the Royal Canadian Air Force.

U.S. Factory Casualties

ACCIDENTS in American aircraft factories during 1943 caused the death of 18,000 workers.

This fact was disclosed recently by the U.S. War Production Board in announcing the inauguration of a National Industrial Safety Campaign.

Gentle Hint

THE pilot of a naval aircraft towing a target for practice shooting by a warship's A.A. guns noticed that the shells burst ahead of his aircraft—and uncomfortably near.

The same unpleasant event was repeated, and, after taking evasive action, the pilot signalled to the warship, "Please note, I am towing this thing, not pushing it."

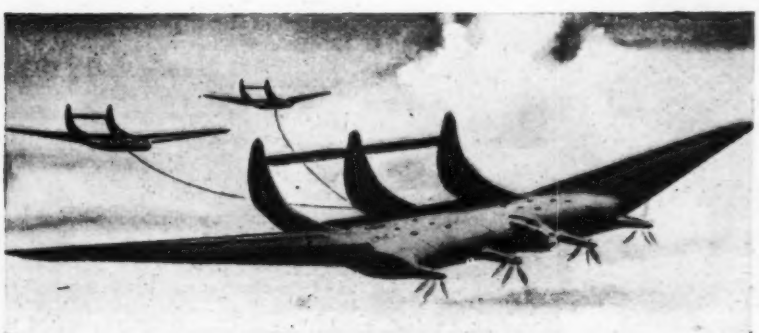
A.O.C., No. 2 T.A.F.

AIR MARSHAL SIR ARTHUR CONINGHAM, K.C.B., D.S.O., M.C., D.F.C., A.F.C., has been appointed A.O.C., No. 2 Tactical Air Force of the R.A.F. based in Great Britain, and has assumed his new command. This preserves the famous Coningham-Montgomery partnership which produced such grand results when Sir Arthur was in command of No. 1 T.A.F. in the Mediterranean.

Director of P.R.

MR. H. A. JONES, who has been appointed Director of Public Relations at the Air Ministry in succession to Air Comdre. Lord Stansgate, was the official Air Historian of the last war and served in the Army and the R.A.F. between 1914 and 1918. As an observer with the 47th Squadron he was wounded in the Salonika campaign.

Mr. Jones wrote five of the six volumes of the Official History of the War, taking over the job when Sir Walter Raleigh died after completing the first volume.



FLYING "FRIGE": An artist's impression of the projected 120 ton refrigerated "fruit express," designed by Burnelli for Colonial Airlines to transport Florida fruit to Canada after the war. Payload is said to be 40 tons. Canadian Car and Foundry Co. has also received orders from a S. American airline for Burnelli aircraft.

MITCHELL'S MIGHT: The 20 lb. shell fired by the 75 mm. cannon successfully used on the B-26. The projectile itself weighs 13 lb.

Mars' Pacific Flight

THE U.S. Navy's flying boat *Mars*—the world's largest operating aircraft—is back in mainland waters after completing a round trip from San Francisco to Honolulu as a military transport. Her flying time from Hawaii was 12 hr. 17 min.

Carrying 20,000 lb. of mail on her return trip, *Mars* made the round trip in 27 hr. 26 min. flying time. She also carried eight passengers and a crew of 17.

Runway Rivalry

OKLAHOMA'S $25,000,000 combined airport, seaplane base and railway station, to be constructed close to the geographical core of U.S. airline routes, is planned to cover six square miles. The airport will be nine miles from the centre of Oklahoma city, and its potential seaplane base is a nearby 2,500-acre lake.

Already the private and local interests have secured most of the space they need and will shortly secure the remainder.

While Boston, Mass., is also planning to extend its airport by 900 acres and to make three runways of 10,000, 8,000 and 7,000 feet long, Oklahoma is going to include two 11,000 feet runways.

One View

PICKING out the world's best aircraft has been a popular pastime ever since the war began. In a recent issue of an American magazine Peter Masefield, formerly technical editor of our contemporary, has set out a list of eighteen aircraft in each of the more important military and civil categories. In twenty-two classifications Masefield gives the palm to America for sixteen of them. Britain, in his judgment, takes the remaining six places; the enemy none!

The article appears in the monthly journal *Flying*.

'Backbone of the Fleet'

Some Seversky Statements Challenged: The Case for the Torpedo-fighter

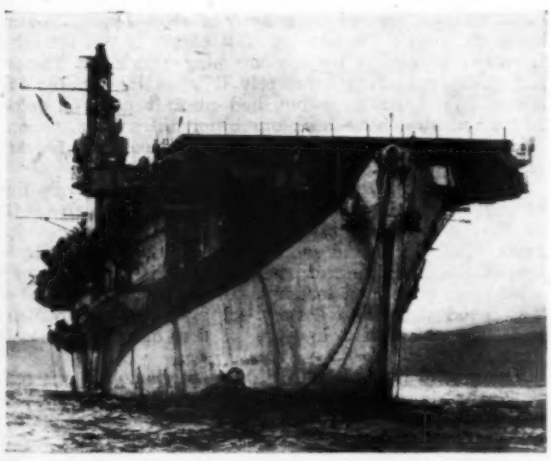
FOR BATTLE: H.M.S. *Indomitable*, one of our new 23,000 ton carriers at speed.

By B. J. HURREN

"THERE is no doubt that Mankind is once more on the move. The very foundations have been shaken and things are again fluid. The tents have been struck, and the Great Caravan of Humanity is once more on the move."

Those prophetic words, as true now as when General Smuts pronounced them in December, 1918, have a special application to the Fleet Air Arm and to the naval air forces of the Allied nations.

Major and minor clues to the trend of events have recently come from America and Britain respectively.



FOR ESCORT: H.M.S. *Battler*, one of the many small carriers designed for convoy escort work.

The Royal Navy has made known, in dribs and drabs, the fact that considerable numbers of escort carriers are coming into service. These faint clues indicate that since last year, when they first appeared in service, the escort carriers are becoming a commonplace. Citing H.M.S. *Biter* as having started her active service in April, 1943, it is now known she has steamed more than 45,000 miles "in the protection of convoys." *Biter* has certainly appeared on North Atlantic convoy work, and her steaming to date is equivalent to 10 Atlantic "round-trips" in less than 10 months. Five escort carriers were present at Salerno, and provided cover for the men on the beaches.

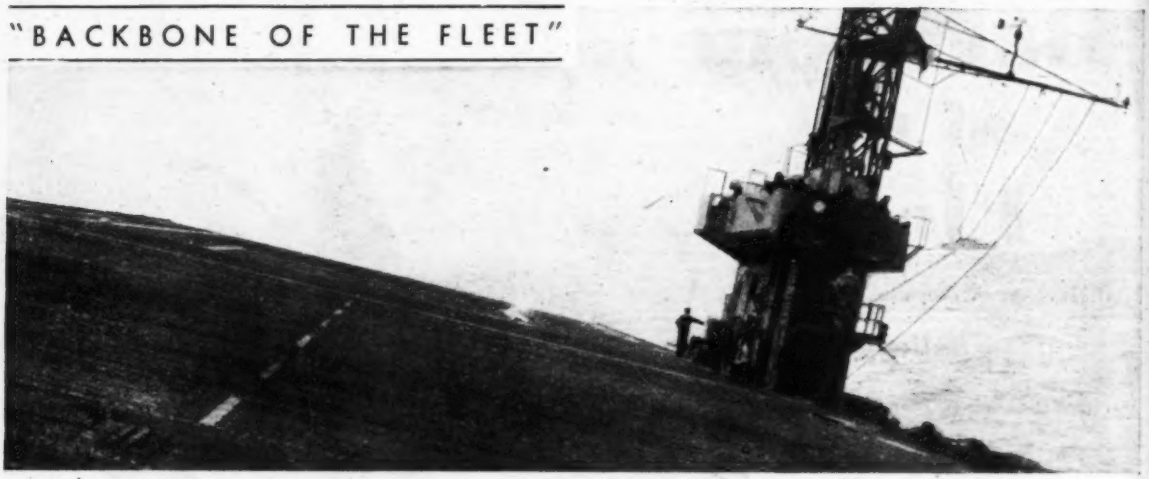
Sea Mileage

In the bigger category of Fleet aircraft carrier, H.M.S. *Victorious* has likewise been restlessly occupied. Between May 1, 1943, and September 16, *Victorious* steamed 26,500 miles, having already clocked 117,718 miles since her commission in 1941, an overall average of 4,904 miles per month. In one hectic month *Victorious* made 8,847 miles, and during one period of 28 consecutive days she steamed 12,233 miles. It is known that at one time *Victorious*, working in close co-operation with the U.S. Navy, sent her aircraft to an American carrier and received on board the aircraft from the U.S. ship, an interchange indicating the very advanced degree of co-operation.

Recently the Admiralty, for an undisclosed but obvious reason, renounced the name *Tarpon* which had been chosen for the Grumman Avenger when in British service; and now confusion which could have arisen by two names for the same job is banished.

Passionate devotion to secrecy—whether the secrets be worth such a title or not—has masked the activities of the carriers of the Royal Navy. So much so, indeed, that an

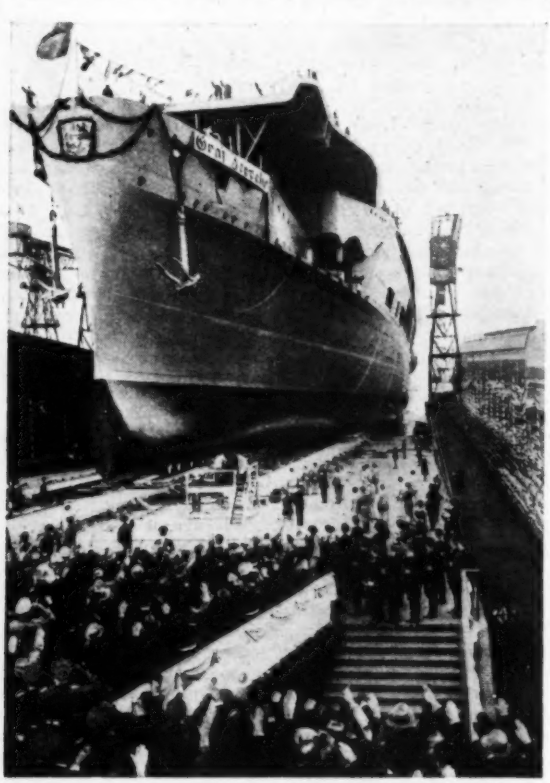
"BACKBONE OF THE FLEET"



NICE DAY FOR A LAND-ON: H.M.S. *Trumpeter* at the mercy of the Atlantic swell.

apathetic public passes by with carefree indifference the huge piles of the official publication, "The Fleet Air Arm," which stack booksellers' stalls. [This book was reviewed in our issue of November 4th, 1943.—ED.]

However, with a welcome candour and certainly without harm to the war effort, the Americans have announced that in 1943 no fewer than 65 aircraft carriers were built. These included six carriers of 27,000 tons of the *Essex* class; nine light carriers of 10,000 tons; and 50 escort carriers. In addition, work is actively progressing on three large carriers of 45,000 tons—proclaimed as the biggest aircraft carriers in the world. It has been stated that heavy twin-engine bombers are to operate from these big carriers.



POMP—AND CIRCUMSTANCE: The launching of the German aircraft carrier *Graf Zeppelin* in December, 1938. It has never yet put to sea.

The growth of American naval aviation is surely one of the outstanding things of this war. The U.S. Navy schedule is for a total of 27,500 aircraft by the end of 1944, indicating at the very minimum by British standards an operational "first-line" force of 10,000 aircraft. Japan, to use an ambiguous phrase, will be sitting pretty—for our attack by sea.

U.S. carrier expansion has caused purple passages against naval aviation from noted American commentators (who have had no sea experience). Despite the fact that the Midway action on June 4th, 1942, was the greatest sea battle of the war, causing to the enemy (a) the complete frustration of his Pacific plans, and (b) the destruction of no fewer than four Japanese carriers, two heavy cruisers, three destroyers, and severe damage to two battleships, persistent efforts to denigrate the successes and potential of the carriers of the Allied fleets continue.

One American commentator whose articles are widely distributed is Major Alexander Seversky. He writes: "No matter how you slice it, thick or thin, large or small, the carrier is still primarily a ferryboat for aircraft and doomed when confronted with genuine air power operating from solid land."

Offensive and Defensive

No sentence could more clearly expose the pier-head outlook (as opposed to the die-hard deep-water mentality) than those remarks, quoted from the *New York Times*, November 17th, 1943. That the aircraft carrier is not merely a ferryboat is evident by the smashing attacks at Taranto and Midway: whilst conversely it is an inescapable fact that wherever we have not had aircraft carriers, defeat and withdrawal have been our bitter pill. Crete, Greece, Norway, Singapore, the Phillipines—to mention a few key places—emphasise this point.

The function of the carrier may be seen as exactly that of any other militant unit: offensive and defensive. On its day, it is superlative in offensive. In defence it has proved itself, time and again; but especially in the narrow seas of the Mediterranean, where the Axis air fleets could muster, on paper, an incomparably overwhelming fleet of land-based aircraft to destroy shipping convoys to Malta and Italy which were, and are, vital to our prosecution of the war.

The second line of denigration of carriers concerns cost. It can be shown, with the greatest facility, that you can build "x" bombers or "y" fighters in lieu of one aircraft carrier "which can be sunk." In war the last thing to be of any consequence is finance: Germany, bankrupt for years, embarked on the greatest war effort in history. Britain, still struggling to pay off debts incurred in the

Napoleonic Wars — let alone later tribal struggles and *l'affaire* 1914-1918—has turned its maximum powers to war production without the faintest possibility of ever paying the price in cash.

Seversky writes: "Three super-carriers are roughly equivalent to 600 of the latest B-29 bombers. Each B-29 will be able to carry five times as much bombing power as the medium bombers operating from the projected carriers. About 100 medium bombers will be able to operate from a super-carrier, yet for the cost of these bombers plus their super-carrier, we could build 200 of the new B-29s. . . ."

Accepting with reservation his statement of the aircraft capacity of the 45,000-ton carrier, we have 300 bombers of considerable striking power.

If they were jointly put into operation against Japan they could patently bring more pressure to bear on the enemy objectives over a period of time than could land-based bombers which, under present conditions, would be compelled to operate from at least hundreds and probably thousands of miles away. In other words, the carriers bring local superiority at the right time and place and can maintain that temporarily. Conversely, the land-based bombers against Japan must waste the greater part of their flying time as no more than ferry aircraft to the scene of combat.

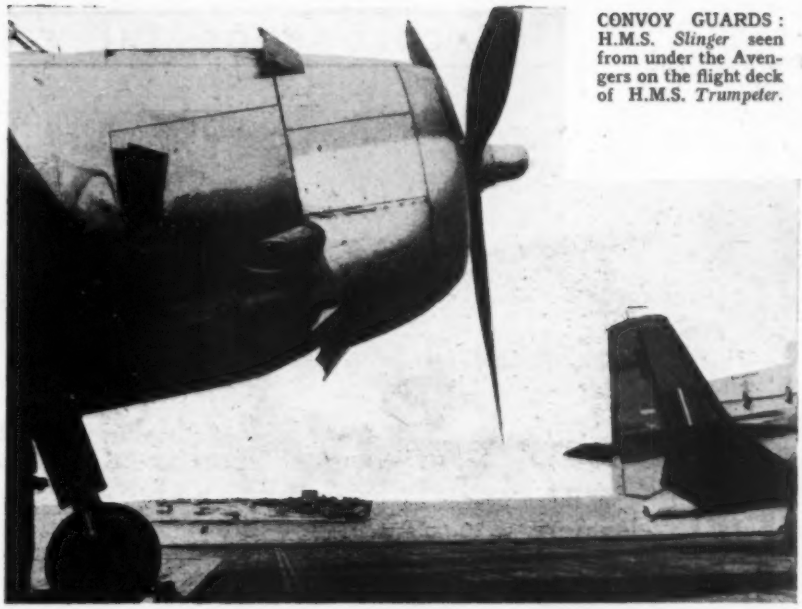
A Case for Carriers

If we were able to establish bases all along the China coast, then there might be a case for land-bombers in the assault on Japan. The time such operations would take (and, of course, the cost of the land bases), precludes a rapid ending to the Far East war—an ending which fleets of carriers could bring about more economically in every sense.

Making a guess at American carrier figures for 1943, the 65 ships represent a maximum of perhaps 6 × 70 aircraft for the *Essex* class; 9 × 30 of the light carrier class; and 50 × 25 of the escort carrier class. With the three 45,000-ton carriers this aggregates a total of 2,240 "first-line" aircraft at sea. This extremely mobile force, with adequate protection against reconnaissance or attack aircraft, must be of maximum consequence in the Far East operations. To its strength must be added the undisclosed, but certainly very considerable, numbers of British aircraft carrier warplanes.

With the new influx of carriers, new types of aircraft are coming into being. The Barracuda and Avenger form powerful additions to the torpedo-bombing category, the one having attributes which the other does not possess, so that together they should present a commanding officer with a flexible weapon for day or night employment.

However, it does not make sense that new fleets of aircraft carriers should come into being without parallel new aircraft. We may expect to see several surprises and what our American friends call "hot numbers."



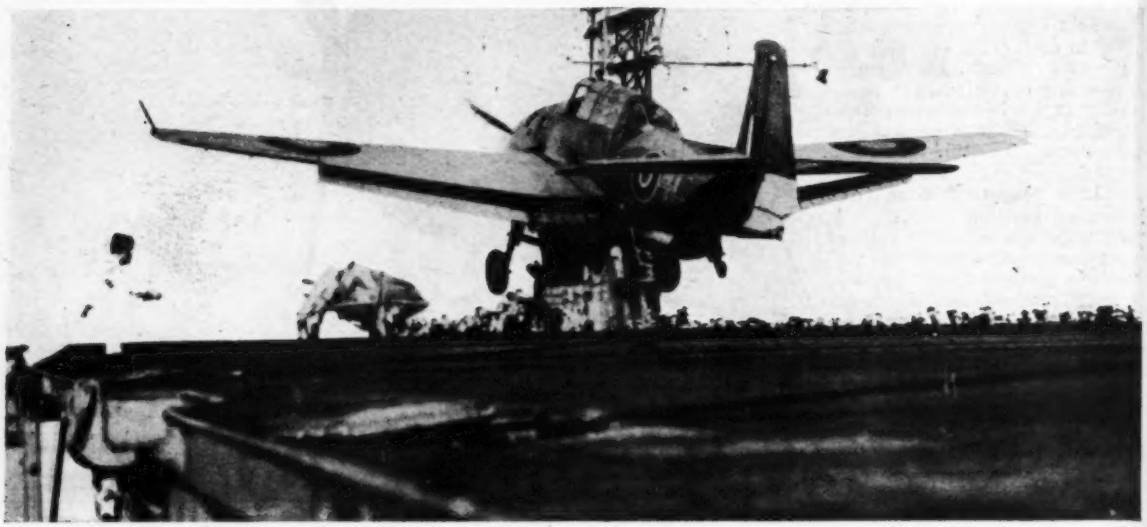
CONVOY GUARDS: H.M.S. *Slinger* seen from under the Avengers on the flight deck of H.M.S. *Trumpeter*.

BEACH GUARDS: A Seafire alighting on H.M.S. *Hunter* after a patrol over the Salerno beaches.

Aviation has a curious trick of advancing in circles—as can be shown many times over. If, therefore, this be true in the history of air progress in the past, all we have to do to see the future (crystal-gazing through the murky glass of official secrecy) is to turn up the reference books for 1924 and see what the line of thought was then.

Ah, what magnificent ideas we then had! There was, for example, the Blackburn Dart, single-seat torpedo bomber . . . a regular scorcher of a machine, flat-out at 77

"BACKBONE OF THE FLEET"



NEARLY DOWN: With the hook hanging from the extreme end of its tail an Avenger alights on H.M.S. *Trumpeter*.

knots. I recall flying from Gosport to Brough in the teeth of a stiffish wind, only to find the L.N.E.R. mainline trains passing me!

Nevertheless, the Dart embodied ideas far in advance of its time. The ideas were good if the performance was weak. The Dart threw away the naval observer and crew—bane of many an aircraft designer for the Navy, for no observer can move even a mile without chart-boards and sufficient impedimenta to trip up an army—and instead called upon the pilot to be the captain of his soul and of the aircraft.

The Dart had a front gun. With its torpedo gone it was extremely manœuvrable: on any fairly windy day you could literally land it on a tennis court. For deck flying it was superb—it took off and landed as easily as could be. Tactically, it could slip its torpedo into the water and then butterfly about to the infuriation of the opposing ship gunners.

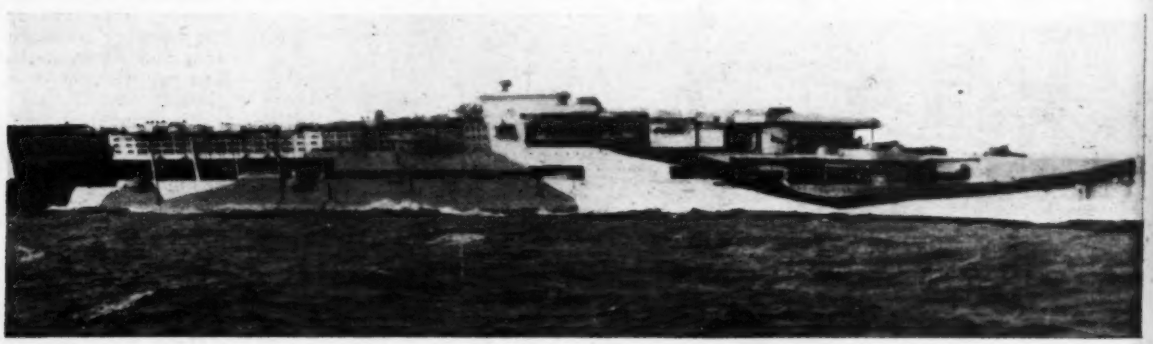
Suppose this idea of a single-seat torpedo-bomber-fighter were revived? It would present tremendous advantages for the one type once much believed in and not so far tried out in this war is this very single-seat torpedo-fighter (excluding the Beaufighter as not a true single-seat aircraft, even if it sometimes flies "one-up").

The torpedo-fighter is something that might be of tremendous value against enemy shipping. By its high speed it could achieve rapid approach—and perhaps surprise approach. Having launched its torpedo, it then becomes a fighter able to machine-gun the ship or shoot down enemy fighters attempting to intercept later waves of torpedo aircraft. It would, to borrow the delightful phrase of the 1924 reference book on the Dart, have indeed an "elastic" characteristic.

Torpedo Accuracy

Major Seversky would argue that for the cost of the one torpedo you could build so many more bombs so much more quickly. In spite of this, there remains the fact that the torpedo—whether launched by watercraft or aircraft—has given the richest dividends by far of any war weapon. The percentage of aircraft-launched torpedo hits against enemy ships has over many periods of active warfare topped 75 per cent., compared with which the percentage of bombing hits is ridiculously small against ships, and the percentage of sinkings by bombing almost negligible. There is an excellent case for fast torpedo-fighters in naval aviation, and this case remains as good to-day as it was nearly 20 years ago.

It is clear that the only hindrance to production of a fast torpedo-fighter for aircraft carrier operation is that



IN BATTLE DRESS: The camouflage painting on H.M.S. *Furious* makes it difficult to see the proper outline. One of our oldest carriers, H.M.S. *Furious*, is unique in having a retractable navigation bridge which leaves a clear deck during flying.

"BACKBONE OF THE FLEET"

until recently the power available for take-off set a limitation to high wing loadings. Now, with such powerful units available as the new 2,000 h.p. Napier Sabre and the potential of the jet propulsion engine—to mention only two—it is clear that the tactical possibility of having an entirely new type of fleet fighter is on the horizon.

There are, however, other equally fascinating projects which probably underlie the American trend of authoritative naval thought; which is to the effect that the aircraft carrier is now the "Backbone of the Fleet," the tactical unit to which others are subservient. This progressive view holds many adherents in the Royal Navy, which has passed its fledgling stage and is rapidly spreading powerful wings over the world's oceans. To paraphrase General Smuts words: "The tents have been struck, and the great might of the Navy is once more on the move."

Jet Propulsion

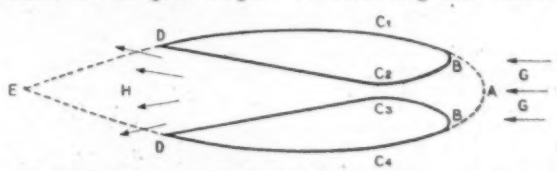
One of the Original Scotland Rocket Research Experimenters Sums Up the General Lines of Development

By J. DENNIS

AT less than the speed of sound a jet only propels the machine that carries it because of the reaction force produced, and this is still more or less true at supersonic speeds.

Let us see then how a jet operates. Mr. Stemmer's article (*Flight*, December 23rd, 1943) gives an account of the jet of one type. This and the true rocket eject gases only which originate in the machine, and the gross weight of the machine falls by the *total* mass of the effective substance.

This is ideal where there is no air, and might be useful if speeds of the order of 2,000 feet per second are to be used. One thing must be made clear, the jet does not *push* against the air like a punt pole against the bottom!



The ring-shaped body BCD will behave much as would the complete streamline body ABCDE and would require little power to drive it.

Experiments carried out in Scotland with the assumption that speeds of over 1,000 feet per second were not yet practicable led to the use of a jet injection system in which *no engine* is used but the main force is produced by driving air drawn in from the atmosphere out again at an increased temperature and velocity.

The latter statement is also true of the Caproni Campini (see *Flight*, February 19th, 1942), but the differences are considerable. If the aim of the engine is to pump, mechanically, air from one side of the narrow space C_2—C_3 to the other (see diagram) then the difference is really greater than the resemblance, for in that case one has only a differently-shaped, differently-placed article doing just what the airscrew does, i.e., taking rotary power and using it to drive the aircraft.

The diagram shows a ring-shaped streamline body BCD which will behave in much the same way as the complete circular solid body ABCDE would have done before the streamline tube was put inside it.

The air passing through will be compressed and will exert a force on the internal surface BC and on the external surface, and this will be partly balanced by the force on CD. The difference is the drag of the body. Now, ignoring the external effects, if we put a heater inside C it is theoretically possible to make the volume of the gas escaping at H so much greater than the equal weight of colder gas entering at G that the force acting on the conical surface CD will be greater than the force acting on BC, and so the device will propel itself. In practice, if one places a jet of hot gas at C this will happen, although the power of the jet in itself is too small to measure.

Now the design due to J. J. Smith for such an aircraft (which we would have made between September, 1939, and May, 1940, if the war had not intervened) would have used a 500 h.p. engine which uses *all* its power in compressing air. This air would have been fed into a ring of two-stage injectors situated at C and fed with fuel oil. The engine would have consumed about three quarters of an ounce of fuel oil per second, and the injectors about a quarter of a pound in the same time. The propulsion power should have been about 4,000 h.p. (abt. 1 ton).

Using a Williams internal combustion turbine engine as compressor, that would have scaled about 4 cwt., and the jet system about 1 cwt. The whole power unit should be easy to make under half a ton, even if the more flexible reciprocating engine were used.

(The advantages of the turbine is a separate subject, best ignored here, but our preference for industrial fuel oil that takes fire less readily than petrol is obvious.)

We should have used a tail-first layout and, indeed, the same parts as experiment 43 at most points.

The greater controllability of tail-first, jet-propelled aircraft is a thing that is easy to understand and is borne out when both are flown under similar conditions.

WHAT ARE THEY PLANNING? Before the war the Airspeed company specialised on civil aircraft. It seems logical to assume that when things become normal that work will be resumed. Here is Mr. A. E. Hagg with his technical staff. From left to right: Mr. Riches; Mr. Chapleo (chief structures engineer); Mr. Jewett (chief development engineer); Mr. Ellison (chief project engineer); Mr. Foss (chief aerodynamicist); Mr. Clarke (chief engineer); Mr. Hagg (technical director); Mr. Jupp (experimental superintendent); Mr. Johnston (chief draughtsman); and Mr Errington (chief test pilot).

Air News from Canada

New R.C.A.F. Transport Command : Civil Aviation Authority : T.C.A. Central Control

THE Royal Canadian Air Force is forming a new transport command which is to handle transatlantic flights carrying mail to all Canadian servicemen in Britain and in the Mediterranean area, according to an announcement at Ottawa by Major C. G. Power, Canada's Air Minister. The new R.C.A.F. service will be in addition to the existing transatlantic service twice weekly operated by Trans-Canada Air Lines, which is using modified Lancasters. R.C.A.F. crews are now being trained for the transatlantic run.

* * *

IMMEDIATE creation in Canada of a central, free and independent government authority for civil aviation, with wide powers to promote, administrate and safeguard the development of air transportation in Canada and on international routes from and through Canada, was recommended at the annual meeting of the Air Industries and Transport Association of Canada held at Toronto recently. Current problems of the aircraft industry were discussed at the two-day session of aircraft manufacturers, suppliers, repair plant operators and transport companies. These included accounting and personnel problems, new overhaul and repair contracts, termination agreements and the excess profits tax, problems of surplus material, insurance, urgent repair requirements and other procedure questions.

R. B. C. Noorduyn, of Noorduyn Aviation, Ltd., Montreal, was re-elected president, with C. H. Dickins, Canadian Pacific Air Lines, Montreal, as vice-president; W. F. English, Trans-Canada Air Lines, Montreal, honorary secretary; M. E. Ashton, Canadian Pacific Air Lines, (aircraft overhaul section), Winnipeg, honorary treasurer. Directors elected were: J. N. Baird, British Aeroplane Engines, Ltd., Montreal; W. N. Deisher, Fleet Aircraft, Ltd., Fort Erie, Ontario; P. C. Garrett, De Havilland Aircraft, Toronto; Grant MacDonald, MacDonald Bros. Aircraft Ltd., Winnipeg; and C. R. Troup, Canadian Pacific Air Lines (air observer schools), Montreal. W. B. Burchall was reappointed executive-secretary, and Walter F. Thorn as general representative, with offices in Ottawa.

* * *

TRANS-CANADA AIR LINES has established a central reservation control office at Toronto to cope with greatly increased wartime passenger traffic. The control office makes it possible to ascertain name, address and destination of any passenger holding space, or in the course of making a flight on any T.C.A. aircraft, within approximately 30 seconds. Special direct wires connect the central office with the western reservation control at Winnipeg, the Atlantic reservation control at Halifax, and the New York reservation control for inter-line reservations in the United States.

A staff of 70 persons, of whom 66 are girls, keeps the office open 24 hours a day. The office has been equipped with the latest in soundproofing and fluorescent lighting. A forecast board along one wall of the telephone room enables the telephone operators from their individual soundproof booths to keep an eye on all T.C.A. flights in progress or scheduled for the day, and gives the latest weather data. Teletype circuits connect the office with all sections of the T.C.A. route from Victoria, B.C., to St. John's, Newfoundland.

OFFICIAL "JET" DIARY

THE following dates and facts summarised by the S.B.A.C. are given in the joint official statement issued by U.S. War Department and Air Ministry and M.A.P.:

1933: Grp. Capt. Whittle, R.A.F., started work on improved jet engines in Great Britain.

1937: April. First engine ran successfully.

1939: Air Ministry place first order for a jet-propelled aircraft with the Gloster Aircraft Co., Ltd. The engines were built by Power Jets, Ltd.

1941: May. First successful flight of Gloster jet aircraft.

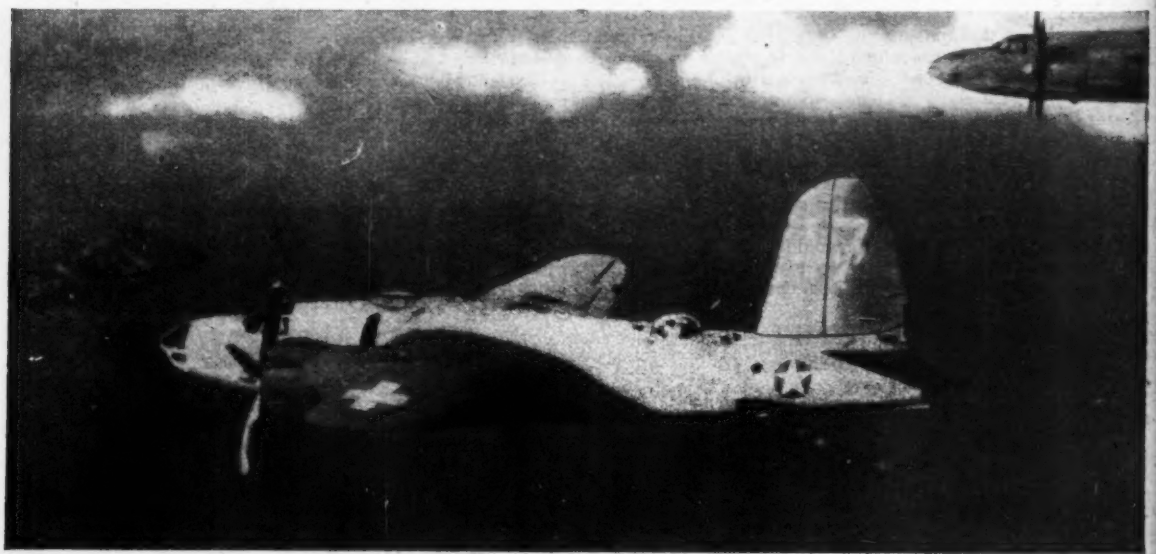
1941: July. Full information disclosed to General Arnold in U.S.A. He asks for the engine to be sent to America, and this was delivered to General Electric Co. in September, 1941.

Bell Aircraft Co. given an order to build an aircraft suitable to take two jet engines, and the first flight was made in U.S.A. in under twelve months.

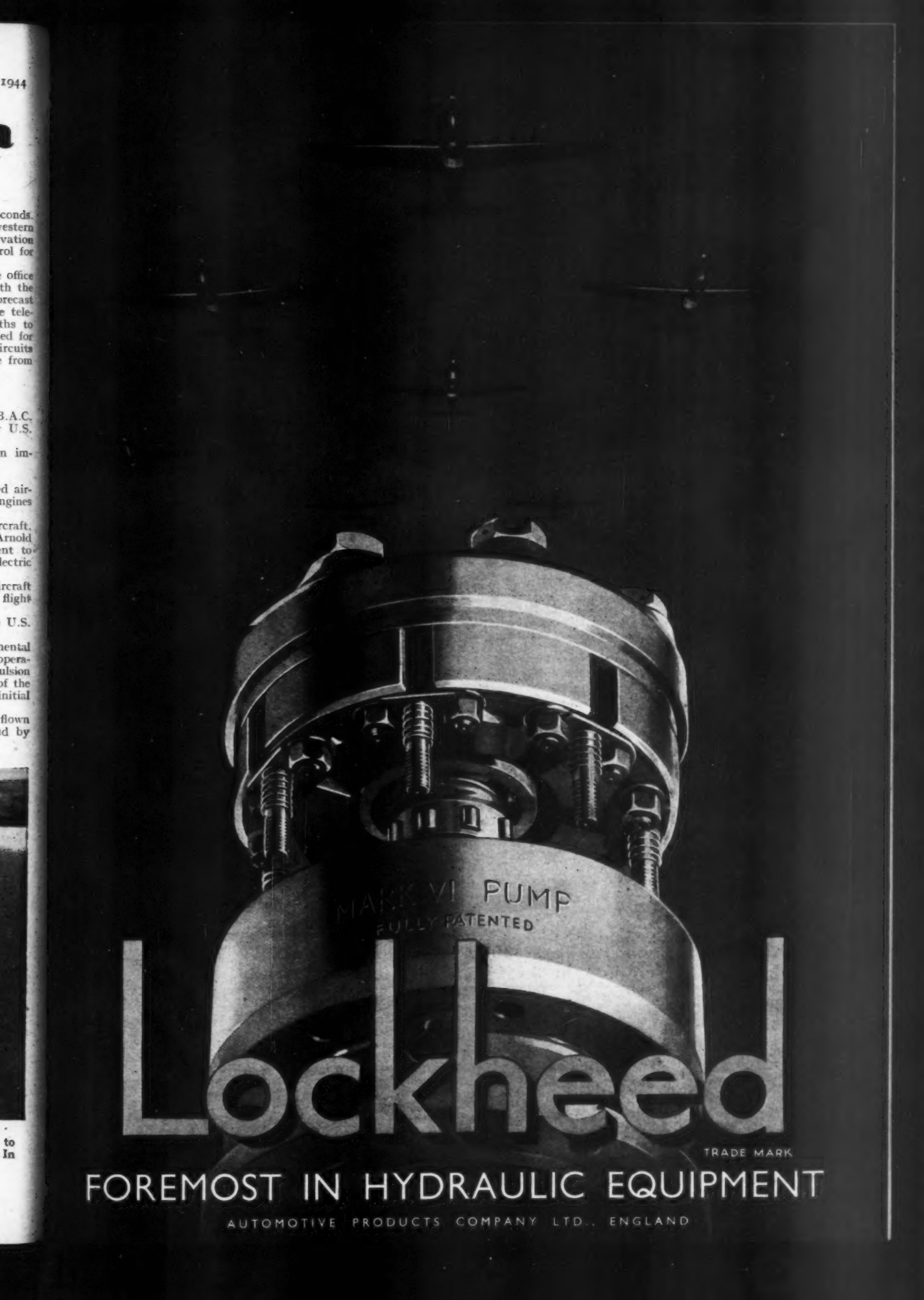
U.S.A. allot a number of jet engines to the U.S. Navy for additional trials and experimentation.

1942: October 1st. Maiden flight of the first experimental aircraft in U.S.A. This was the first successful operation of a combat aircraft using the jet propulsion principle. Robert M. Stanley, chief test pilot of the Bell Aircraft Co., was at the controls for the initial flight.

In U.K. the jet-propelled aircraft has been flown by a number of test pilots of aircraft firms and by R.A.F. officers.



LIGHTENING THE LOAD: Readers of *Flight* who have argued in the correspondence columns on the "to dump or not to dump" question will be interested in this picture of a B-26 Marauder, with port engine u.s., jettisoning ammunition belts. In this instance power-loading was the vital factor, and the bomber reached its base from the Italian lines.


PUMP
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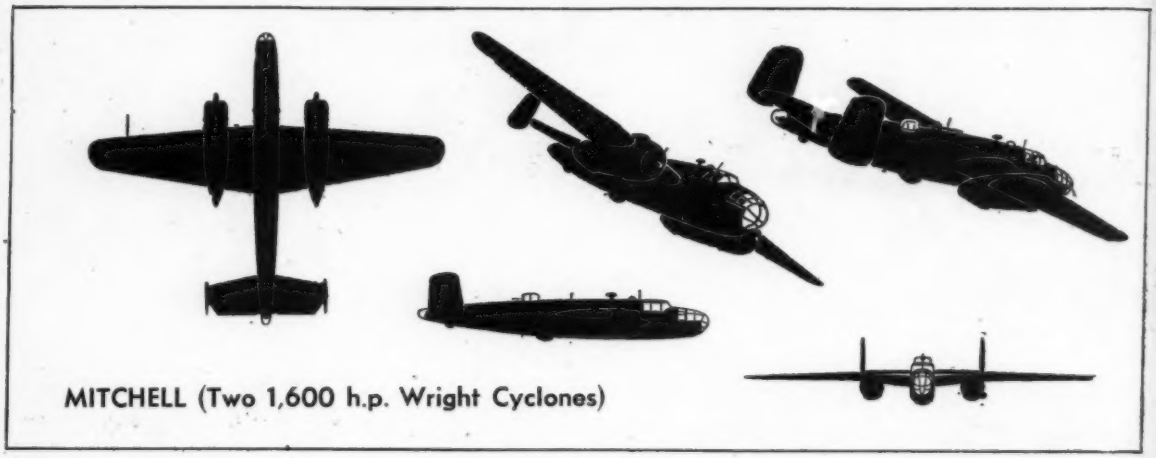
Studies in Recognition

Aircraft in F

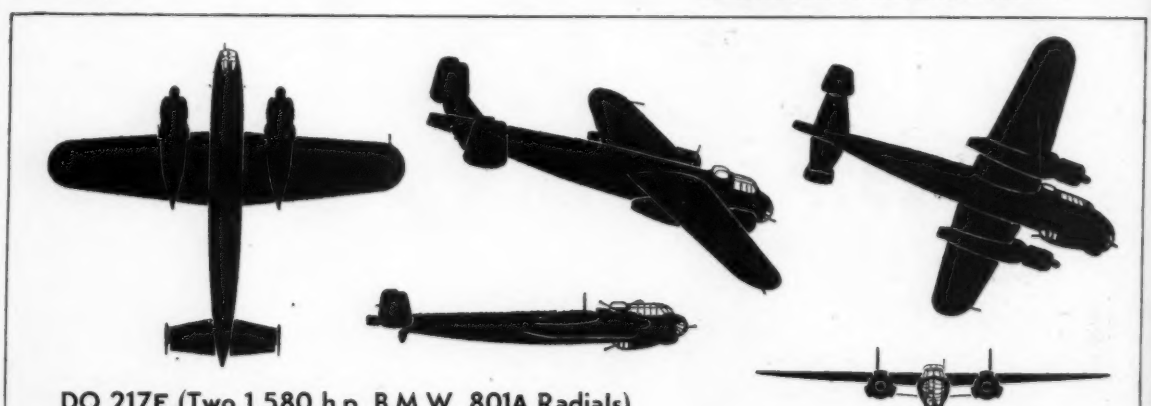


MITCHELL (Two 1,600 h.p. Wright Cyclones)

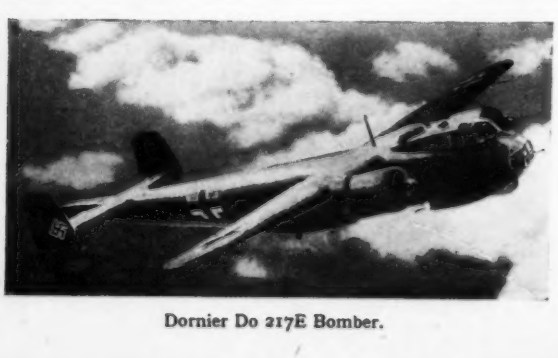
NOTABLE for having been recently fitted with a cannon of no less than 75 mm., the North American Mitchell (B-25C) is normally armed with a 0.30in. machine gun in the nose, and pairs of 0.5in. machine guns in dorsal and ventral power-operated turrets, the latter being the retractable ball type. Power is supplied by two 1,600 h.p. GR-2600 14 cyl. Wright Cyclones and top speed is close on 300 m.p.h. A 4,000lb. bomb load is internally stowed.

Several unusual features distinguish the Mitchell for recognition purposes, the most notable being that its slightly "gulled" mid-wings have a small degree of negative dihedral angle outboard of the engines. It also has a tricycle undercarriage, heavy underslung nacelles which extend aft of the trailing edge and an extremely long nose. Wings taper to round tips and twin endplate fins and rudders are almost rectangular. Dimensions: Span 67ft. 7in., length 54ft. 1in., height 15ft. 10in., wing area 610 sq. ft.

North American Mitchell Medium Bomber.



DO 217E (Two 1,580 h.p. B.M.W. 801A Radials)

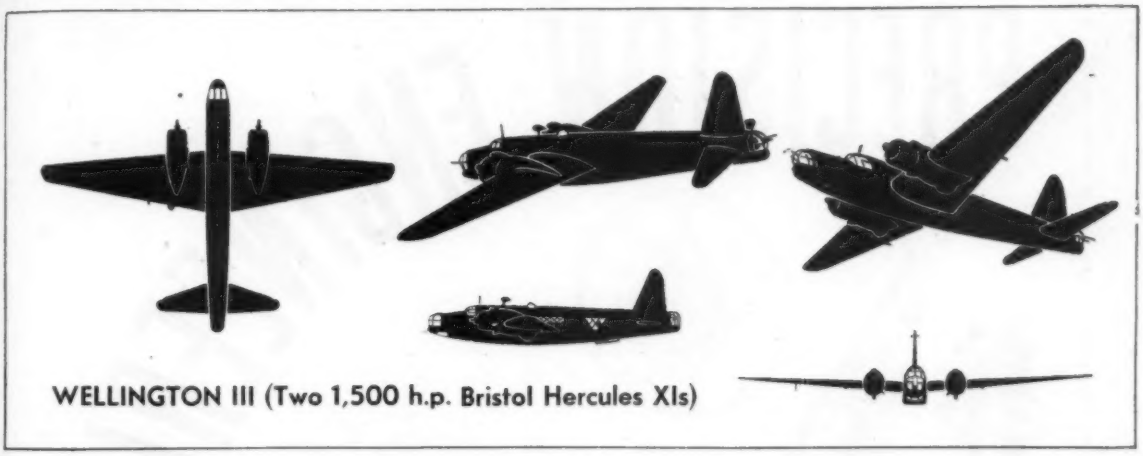


Dornier Do 217E Bomber.

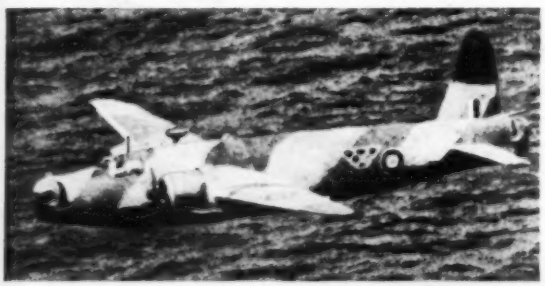
DORNIERS are the only high, or shoulder, wing bombers in service with the *Luftwaffe* and several variants of the Do 217E exist. More recently they have been encountered as night-fighters, and the latest news says that Do 217's carrying a single 1,000lb. radio-controlled rocket glider-bomb have been used.

Employing the "snake's head" type of fuselage in which the entire crew is crowded into one cabin in front of the leading-edge, the Do 217E is fitted with a pair of 1,580 h.p. B.M.W. 801A engines and top speed is about 300 m.p.h. The difference between the E1 and the E2 is that the latter has a power-operated dorsal gun-turret. Both types have a fixed 15 mm. cannon in the nose. The "umbrella" dive-brakes once fitted to the tail of the E2 have been abandoned in favour of a conventional type under the wings. Low aspect-ratio wings with broad round tips, underslung nacelles and angular twin fins and rudders are other recognition points. Dimensions: Span 62ft. 5in., length 56ft. 6in., wing area 610 sq. ft.

fing Attitudes



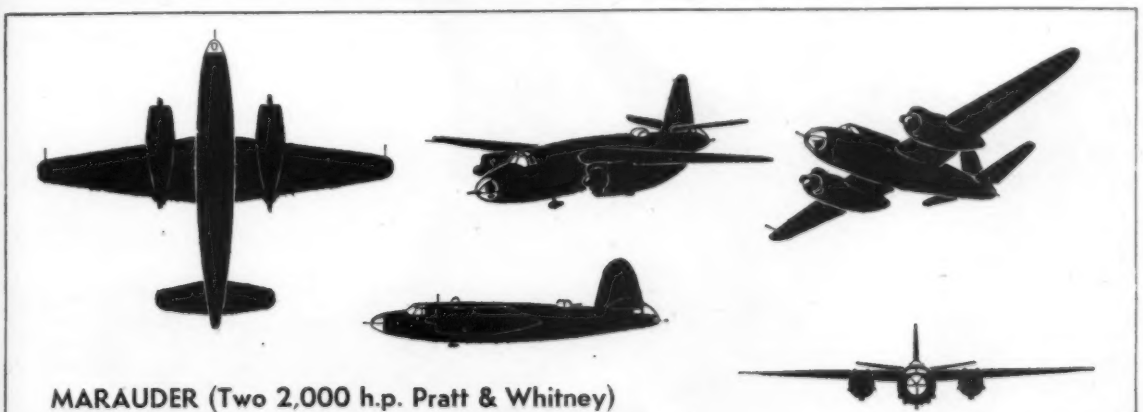
WELLINGTON III (Two 1,500 h.p. Bristol Hercules XIs)



Vickers Wellington Medium-heavy Bomber.

THE various marks of Vickers Wellington bomber now in service differ only in the types of engines fitted and in equipment and certain other details; as regards dimensions, construction and general outline they are virtually identical and are recognised by the deep, well-shaped fuselage, the high aspect-ratio tapered mid-wings with small tips and dihedral from the roots, engines set close to the fuselage, high aspect-ratio tapered tailplane and tall tapered fin and rudder.

The mark III illustrated has two 1,500 h.p. Bristol Hercules XI sleeve-valve radial engines, two- and four-gun power-operated turrets in nose and tail respectively, and triangular "lattice" windows on each flank aft of amidships. The long windows forward are not present on all versions. Faired D/F loop and astro-dome are above centre-section. Top speed of the Wellington III is 260 m.p.h. at 10,750ft. Bomb load 4,000lb. Dimensions: Span 86ft. 2in., length 61ft. 3in., height 17ft. 5in., wing area 840 sq. ft.



MARAUDER (Two 2,000 h.p. Pratt & Whitney)

ALTHOUGH it is reported that production of the Martin Marauder (B-26C) is being tapered off in favour of other types offering better production features, this fast medium bomber is still doing good work. Powered by two 2,000 h.p. 18 cylinder P. & W. Double Wasps, its top speed is about 285 m.p.h. at 15,000 ft., and it carries a maximum bomb-load of 2,460lb., or a 2,000lb. torpedo slung externally.

To mitigate a too high landing and take-off speed, the 65ft. span of the B-26A and B was increased to 71ft. on the B-26C, but this has reduced the top speed to less than its original 300 m.p.h. Armament comprises a hand-operated 0.5in. machine gun in the nose and twin 0.5in. guns in powered-operated dorsal and tail turrets. Recognition features include tapered high wings with long heavy underslung nacelles extending aft of trailing edge, streamlined circular-sectioned fuselage, dihedral to tailplane and large single fin and rudder. Dimensions: Span 71ft., length 58ft. 2in., height 20ft., wing area 576 sq. ft.

Martin Marauder Medium Bomber.

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Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Safe-conduct

FROM neutral sources it is learned that negotiations are in progress between the Swedish and German Governments for a German safe-conduct for Swedish air traffic to Britain. As yet it is not known whether these negotiations have met with any measure of success, but it can be assumed that the difficulties are in the conditions which the Germans try to impose.

Jap Display

A MORALE-BUILDING parade of the Japanese Air Force is reported by German correspondents to have taken place during the last month in Tokyo. About 750 aircraft of the Army Air Force, led by Lt. Gen. Matsuoko, are said to have participated in the display, in which formations of Japan's latest bombers, the *Donryu*, the *Shintei* reconnaissance aircraft, and the *Skoki* fighters took part.

Comment

REINHARD ALBRECHT, German war correspondent, who watched the Allied landing at Nettuno, described the operation as "a spectacle—beautiful and awe-inspiring alike." "This hand-in-hand play of enemy fighters, bombers and men-of-war, the drum-rolls of fire from the sea and the air; the continuous thunder of broadsides, the crushing bangs of tank cannons—all combine to make a spectacle beautiful and awe-inspiring alike."

"The naval escort, comprising battleships and aircraft carriers, was very strong. Its covering fire enabled the invading forces to build a corrugated tank road along which the heavy armoured vehicles are rolling on the land. Our planes have chosen it as their target, but as matters stand, cannot rule the Italian skies to-day unless you have an alliance with the devil."

Award

ACCORDING to the Hungarian official gazette, the Regent has awarded the Middle Cross of the Hungarian Order of Merit to Directors K. Korbuly and A. Schnetzer for services in the development of Hungarian aircraft production.

Air Traffic

IT is reported from Sofia that in the preliminary budget proposals of the Bulgarian Government, provision has been made to extend the agreement with Ala Littoria up to August 15th, 1944. The Ala Littoria operates the service from Rome via Sofia to Bucharest.

Special legislation has been passed to release Air France from its agreement on the basis of which the French company operated the service Dragoman-Sofia-Plovdiv-Svilengrad.

Richthofen Squadron

SO great have been the losses of the famous Richthofen squadron, now operating on the Channel coast, that the present commander, Major Egon Mayer, holder of the Oak Leaves decoration, is the only surviving officer who knew the two preceding commanders, said a front line report over the German radio, quoted by Reuter.

The squadron lost its first commander and ace fighter, Major Weist, in the Battle of Britain. His successor, Captain Balthasar, was shot down in the summer of 1941, "when," said the reporter, "we found ourselves outnumbered for the first time owing to the Russian campaign. We have been outnumbered ever since. Year by year the enemy has come over with heavier bombers covered by strong fighter escort, which looked like spitting hedgehogs. It takes courage to attack them, and the physical and mental strain on the pilots has increased enormously with the speed of their machines."

EXPECTATION: German fighter-pilots waiting near their Focke-Wulf Fw 190s at an airfield on the Channel Coast.

French Development

GNOME AND RHONE the French aircraft engine company, is reported to be developing a 28-cylinder high-performance engine derived from the models 14R of 1,590 h.p. and 14-cylinders, and the 2,200 h.p. 18-cylinder 18R type.

In the new engine, which is composed of four radial rows of cylinders, the cylinders of the first and third rows are to be placed in line behind each other, whereas those of the second and fourth rows are offset to the first row by half a cylinder space. For the positive feeding of the cooling air a blower will be mounted in the air intake area of the engine cowling, resembling the arrangement adopted in the BMW 801. The engine is to be equipped with two superchargers and direct fuel injection. A drive will be provided for coaxial contra-rotating airscrews.

Following are the preliminary characteristics and performance data: bore, 5¼in. (146 mm.); stroke, 6½in. (165 mm.); total volume, 4,719.5 cu. in. (77.34 lit.); compression ratio 1 to 6.4; diameter 51in. (1,297 mm.); max. power, 3,750 h.p. at 19,700ft.

The VG 50 experimental aircraft developed by the State Arsenal at Lyons-Villeurbanne, and previously reported on this page was intended to test a new power plant arrangement consisting of two 1,200 h.p. Hispano-Suiza 12Y liquid-cooled 12-cylinder in-line engines mounted in tandem and driving coaxial contra-rotating airscrews.

The extension shaft of the rear engine features a "homocinetic" coupling composed of four flexibly-mounted ball joints, and uses the bearing originally provided in the front of the engine for the mounting of the cannon.

According to reports the "homocinetic" coupling has already been developed for a new 24-cylinder Hispano engine which is credited with an output of 4,000 h.p., but which is still under development.

The studies conducted at the Arsenal are concerned with an arrangement which dispenses with a rigid mounting on the front engine—such as the gun bearing of the Hispano 12Y—and provides for coaxial extension shafts between the engines and the airscrews; corresponding coaxial coupling pairs for the latter are under development. The possibility of four coaxial airscrews rotating in opposite directions are also reported to be under investigation.

Under development at the Arsenal is also an aircraft powered with four Hispano 12Z 12-cyl. engines, equipped with a pressure cabin and constructed in improved wood.

Air Observation Post

Austers Spot for Eighth Army Guns: Vital Phase of Air-land Co-operation: Khaki Pilots

THE ways of official censorship are passing strange, and although it has long been permitted to refer to the several light types of American aircraft used by the British Forces as well as the U.S. Army, it has only recently been permitted to dispel the inevitable inference that Britain has no such aircraft of her own, by mention of the good work being done by the Taylorcraft Auster.

Auster I aircraft, with Cirrus engines, were, in fact, doing valuable work on active service right at the beginning of the war, and now one of the important duties being fulfilled by the Auster III (Gipsy Major) is that of spotting for the Eighth Army's artillery on the Italian front, where these pictures were taken.

In short, the "observation post" of the artillery has now become an "air observation post"—reduced by the usual Service formula to A.O.P.—and the Austers are flown by khaki-clad artillery captains who have been trained for their wings by the R.A.F., which also supplies a certain number of ground staff for maintenance work.

Simple and Effective

The A.O.P. squadron in the field comes under the operational control of the Army, and the *modus operandi* is simple and effective. The officer aloft in his flying "observation post" is in R/T communication with the "gun position officer," to whom he gives the necessary corrections as he observes where his battery's shells are falling. The G.P.O. then passes on the necessary information to the guns.

Once again, the primary necessity for air supremacy in all military undertakings to-day is clearly seen. The Austers are unarmed, and in spite of what may be said about small and comparatively slow aircraft being difficult targets for 350 m.p.h. fighters, the fact that "Grasshoppers" can stooge around on their spotting job without let

ROUGH AND READY: Army and R.A.F. men together maintain the artillery's Austers in the field. 1. Al fresco running repairs. 2. Refuelling is done with a can and a tin funnel, as the Auster's tank has a capacity of only ten gallons.

3. The Auster's pilot is an artillery captain who gives the required "gen" to the gun position officer by R/T.

4. An Auster taking off from its temporary airfield near the guns; note the cloud of dust in its wake from the dirt surface.

5. The village of Fossacesia, left in ruins by the retreating Germans, seen from an A.O.P. of the Eighth Army's guns.

6. The G.P.O. receives corrections from the Auster's pilot for the 5.5in. gun seen firing in the background.

7. An Auster III returning after a successful shoot, is greeted by the jubilant gun crew who evidently appreciate the valuable contribution its pilot has made to the effectiveness of their fire.

or hindrance from the enemy must obviously be a vital factor in doing that job efficiently.

A modification of a very popular peacetime light aircraft widely used by private owners and clubs, the Auster III (previously described in *Flight*) embraces all the advantages of the "Grasshopper" type for this class of work. The transparent top and sides of its fuselage have been extended well to the rear so that, being a high-wing type, its pilot has an exceptionally good range of vision. Furthermore, its flying characteristics enable it to operate from any reasonably flat space of quite modest size; any fairly decent road that runs straight for a couple of hundred yards or so without lofty obstructions in its

AIR OBSERVATION POSTS

immediate vicinity, a small meadow, or even a reasonably smooth cart-track will do, for with trailing-edge flaps and light wing-loading it can climb steeply from a short take-off run, and land in a steep, slow glide to come to a stand-still in very few yards.

Equally important for an aircraft which must be used, housed and maintained under primitive and often "tough" conditions, its construction is sturdy enough to withstand rough handling, constant exposure to all weathers, and servicing facilities that resemble "roadside repairs" (to use a familiar motoring phrase) rather than the accepted R.A.F. standard of aircraft maintenance that goes with well-equipped hangars and workshops.

This sturdiness, moreover, is allied to simplicity—an equally important factor in quick and easy maintenance. The fuselage is a straightforward structure of welded steel tubes with fabric covering which can easily be patched and which, experience has shown, stands up to all-weather exposure remarkably well. The same simplicity is seen in the wings in which the main spars are merely spruce planks placed "on edge," and in the undercarriage, which is of simple tripod type, employing a rubber cord shock absorber.

An A.O.P. pilot receives his final instructions before taking off to direct the artillery fire.

Heavy Bombers and Pathfinders

Britain's Conquest of the Weather

By MAJOR F. A. de V. ROBERTSON, V.D.

WHEN Zeppelins and Schütte-Lanz airships were raiding Great Britain during the first world war, people in this country used to dread fine clear nights. Cloud and murk were welcomed as a protection, for they could checkmate the air raider. One of the most remarkable developments of the present war is the absolute reversal of the former attitudes of air attack and air defence towards the weather. Now all elements of the defence, the searchlights, the A.A. guns, and particularly the night-fighters, like bright clear nights. The night-fighter pilots are always praying for light, more light. On the other hand, British developments have enabled the night-bombers to master the impediments of cloud, murk and general invisibility. Clouds provide them with cover against fighter attacks, and in these days great care is taken in timing the attack to avoid those hours of the night when the moon is up.

This ability to overcome the handicap of bad weather is one of the greatest triumphs of the R.A.F. in the present war. To see it in its proper perspective it will be well to look back and contrast the different objects with which the Royal Air Force and the *Luftwaffe* prepared for war.

Foresight

Between the signing of the treaty of Versailles and the year 1935 the R.A.F. was pitifully weak in numbers. None the less, Britain, while disarming to the danger point, did not entirely neglect all planning for war. It was recognised that the first necessity was to keep the sea lanes open. If ships could not sail to and from the British Isles, then Britain was beaten, and no power at all by land or air could save her. The part which would ultimately be played by Coastal Command in helping to keep the sea lanes open was not then foreseen; but the principle was sound, although there was (quite naturally) miscalculation of the means to be used to attain the object.

The second necessity in the British outlook was the air defence of Great Britain. At one time the Command known by the initials A.D.G.B. (the first Command to be given an Air Officer Commanding-in-Chief) included both bombers and fighters; but logic finally had its way and Fighter Command was formed.

The third necessity laid down in this planning was an air offensive against any enemy, which resulted in the formation of Bomber Command. To have allotted only third place among the priorities to this necessity seems an infringement of the maxim that attack is the best form of defence. So it was, but an even more compelling maxim of war is the necessity of making one's base secure before attempting other operations.

Allies Share

War plans before 1935 were rightly based on an alliance with France, but the view taken was more or less a repetition of that held in 1913. France, in each case, had a powerful Army; Britain only a tiny one. The collapse of the French Army in 1940 was never foreseen. The British Navy, though much reduced, would provide Britain's main contribution to the alliance. It seemed to the planners of those days that the best additional help to be given in the land campaign would be an air striking force. This ultimately took shape in the Advanced Air Striking Force, which, however, never really struck. In fact, the needs of the British Expeditionary Force in France postponed the day when a real beginning could be made in building up Bomber Command to what it has since become.

Other factors also intervened to postpone that day. One was the German invasion of Norway, which prevented the Royal Navy from laying mines in the Baltic; so that task had to be shouldered by Bomber Command.

Now let us turn to the German outlook on air war. The *Luftwaffe* was built up in 1935. Though it was made an independent Service (rightly including the *flak* and the searchlight formations), it was intended to act as one powerful arm of the German Army, and, to a lesser extent, of the German Navy. Strategic bombing was not envisaged. The Stuka was an aircraft designed to take part in land battles, and in the campaigns in Poland, Norway and France it justified the hopes placed upon it. The twin-

HEAVY BOMBERS AND PATHFINDERS

engined bombers, Dorniers and Heinkels at first, and the Junkers 88 a bit later, were meant to strike at the rear of the enemy's armies, and also to break his will to resist by such barbarities as the wholesale slaughter of civilians in Warsaw, Rotterdam and other places. They depended on speed, not on armament, for their protection, and when they were put into mass production they were actually faster than the existing British fighters. Göring did not foresee the Hurricane and the Spitfire.

The German fighters, of which the Me 109 was at first the most prominent and numerous, were intended to destroy enemy bombers rather than to engage in dog-fights with enemy fighters. The Me 110 was produced as an escort fighter, but proved a failure in that role, and had to be used as a defensive night-fighter.

It was a natural result of these conceptions that when the *Luftwaffe* undertook independent operations in the Battle of Britain it met with a heavy defeat.

In June, 1941, Hitler made (in the words of Mr. Ghandi) his "Himalayan error." He attacked Russia. From that time it became possible for Bomber Command to get the aircraft it needed and to prepare for its great offensive.

By the end of 1942 it was in a strong position. The Germans, however, had set us a standard. On Coventry they had dropped bombs at an average rate of one ton a minute, and they had devastated a large area of the city. Bomber Command set itself to do far better than that.

Planned Offensive

Retaliation has never been part of British air policy. As was shown above an air offensive had been from the first a part of the British war plan. At the same time it has been realised that a bomber force needs to be flexible. It must be able to help the other Services when they need it. The heavy bombers can be diverted from raids on factories to strike at other important targets. Heavy bombers have been used in that way lately in the Mediterranean campaign.

As everyone knows, Bomber Command deliberately sticks to the policy of night work for heavy machines, though it sends out medium bombers by day under fighter escort. Early in the war the belief was generally entertained that our night-bombers could pin-point targets in enemy towns in the darkness. Now the policy of area bombing has been adopted as the one sure means of dealing with all the dispersed war factories in an area.

But clouds can obscure even large areas. The Ruhr, for example, is always a difficult target in which to ask our aircrews to identify special targets. There is always a haze over an industrial area where many furnaces are burning. By night one part of the Ruhr looks very like another. In addition, the Germans try to bewilder our aircrews by dummy fires and other wiles. All these things militate against a heavy concentration of bombs on the right target.

To remedy this, the Pathfinder Force was instituted in the summer of 1942. It was not recruited as a separate body, but specially skilled crews were selected from among the squadrons, and a system of working was drawn up. At first these crews were aided by no special aids. They worked on regular established lines, but these were improved and systematised.

It is telling the enemy nothing to say that the Pathfinders work by dropping flares, which are called target indicators (T.I. in Service slang). As is well known, both ground markers and sky markers are used; and coloured flares naturally come in useful for giving instructions to the crews which follow on. The load of flares carried by each Pathfinder machine is not heavy, and so bombs can be and are carried, too.

Scientific Aids

British scientists are always at work, and since the Pathfinder Force was formed they have provided it with some very useful devices. Obviously these cannot be described. Likewise the names of the scientists responsible are not generally known. In due course, no doubt, they will receive the fame and the honour which are their due. It is a proof of their skill that most of Berlin has been bombed through what airmen call "ten tenths" cloud, which means that the whole of the city was obscured. After each raid several days passed before the photographic aircraft were able to obtain pictures of the damage done—which shows the sort of weather that was prevalent.

It is a great honour to belong to the Pathfinder Force. Often crews which have reason to be proud of their skill volunteer to join it, but not all who volunteer are accepted. In the main, specially skilled crews are selected, and a crew is nearly always taken as a whole. One can imagine that commanders of Groups and squadrons are not always pleased to lose the best crew from their commands. These crews are put through a course of training, and then they take part in a number of operational flights to test their abilities before they are permitted to undertake the responsibility of guiding the striking force.

The Pathfinder Force is no "suicide club." It would be impossible to keep a body of specialists up to form if that were the case. They run no greater risks than the other bombers. The damage done to German production for which they are responsible is out of all proportion to the strength of the Force.

AUSTRALIANS IN HIGH AIR POSTS

THE appointment of Air Marshal Sir Arthur Coningham to command No. 2 Tactical Air Force in Britain adds the name of another Australian to the list of men from the Commonwealth occupying important air posts in the Royal Air Force. Apart from many Australians of lesser rank occupying R.A.F. positions, leading Australians in air affairs in Britain now include:—

Air Marshal Sir A. M. ("Peter") Drummond, K.C.B., D.S.O., O.B.E., M.C., R.A.F., of Perth, Western Australia, Air Member for Training; Air Marshal Sir Arthur Coningham, K.C.B., D.S.O., M.C., D.F.C., A.F.C., R.A.F., of Brisbane, Queensland, Air Officer Commanding No. 2 Tactical Air Force of the R.A.F. based in Britain; Air Vice-Marshal D. C. T. Bennett, C.B.E., D.S.O., R.A.F., of Queensland, Commanding Officer, Pathfinder Force; Air Vice-Marshal H. V. Champion De Crespigny, C.B., M.C., D.F.C., R.A.F., of Perth, Western Australia, Air Officer Commanding a R.A.F. flying training group; Group Captain Hughie I. Edwards, V.C., D.S.O., D.F.C., R.A.F., of Perth, Western Australia, Commanding Officer of a R.A.F. bomber station at which there is a R.A.A.F. Squadron; Group Capt. W. H. Myle, D.F.C., R.A.F., of Kalgoorlie, Western Australia, C.O. of a R.A.F. bomber station.

"CHARLEY CHAN"

"CHARLEY CHAN" is flying with the R.A.F.; he is not the famous detective of fiction but a Chinese pilot in a Spitfire squadron in Italy whom his colleagues have so nicknamed.

This squadron, engaged on tactical reconnaissance duties, is a "United Nations" effort. Its pilots come from England, Scotland, America, China, Canada, Australia and South Africa. One of the first to land in North Africa, the squadron operated throughout the campaign. It covered the landings at Pantelleria and Lampedusa, and operated from Sicily before moving into Italy.

The Chinese pilot—one of the few in the R.A.F.—was born at Singapore and is therefore of British nationality. A 28-years-old flying officer, he gained his first aeronautical experience as a member of a civil flying club. He left the Far East after Japan's entry into the war, came to England by way of Australia and Canada, and entered the R.A.F., where his previous experience gave him a flying start.

Trained on twin-engined aircraft, he was chosen to ferry medium bombers to North Africa in the course of the Tunisian campaign, but having arrived in North Africa last March, he remained with his present squadron.

The Student's Point of View

Training of Engineers for the Speeded-up Tempo Needed in Post-war Industry

By B. J. STEDMAN

IN recent times the lecture halls of many engineering institutions have reverberated with arguments as diverse as they are plentiful on the subject of how to train our future engineers. Having experienced some of these discussions, the writer feels that as one who has only just completed his training he would like to state his views on a subject which, he feels, so far has tended to be discussed above the student's head, and to a large extent without the student being consulted.

First, it is essential to look at the background or historical cause of this controversy. It must be apparent to all who are connected with the industry to-day that great changes have already come about in engineering, but these are small compared with those which loom ahead in the post-war era. The engineering industry used to be predominantly engaged on small-scale or jobbing production. During the war, expansion has shown up the need for specialised qualifications that were hitherto unnecessary, and because of this there has been found a very great lack of engineers with experience and ability to master the special aspects of large-scale production.

A GREAT deal has been written and spoken recently on the subject of engineering training and special reference has been made to the provision of an adequate number of highly aeronautical engineers to meet post-war needs. Nearly everyone has had a say in the matter, except the student himself. The author of this article is a young man who has just completed his aeronautical training, and here he gives his views on what is wanted. He is, it might be added, a student member of the Institution of Production Engineers.

It can be said that the theoretical side is fairly well catered for and as advanced as any other country in the world, but as the scale of production has progressively risen, so the attendant functions of Planning, Production Control, Methods, Costs, Maintenance, etc., have become progressively more important, demanding the full-time attention of an executive. It is frequently argued that far from growing, the industry will decrease in size after the war. However, as always occurs in wartime, the great technical advances that have been made have enabled needs of the population to be met where this would have been impossible a decade ago. Similarly, our engineering resources have been vastly increased, due to Government subsidising of industrial plant, and we can see, for example, that in post-war Europe as in this country the need for many of the engineers' products will be greater than ever before to make up for years of non-productivity. Even if industry does decrease in size, the need for these new functions under all conditions will have been realised.

Post-war Situation

So here we have a vastly changed situation. The general tempo of engineering has been speeded up. New methods of production have been discovered, openings in industry have been developed, and these new openings require new personnel. What then of the engineer trained in the pre-war era and brutally launched out on to the turbulent seas of this minor industrial revolution; and what of the student and apprentice now training along lines that have hardly changed in the last 20 years?

The remedies, as has been stated, are many and various, but they appear to resolve themselves into two distinct schools: those who support specialisation and those who support generalisation—a term that has been coined merely to meet the needs of the situation. The former believe in early division of studies and exclusive knowledge of specialised subjects; the latter believe just as adamantly in "A little bit of everything." Both these policies are extremes—indeed it is usual for great changes to bring extremes. Let us consider both arguments from the point of view of their supporters, if it is possible to be unbiased under such conditions.

Specialisation

It is argued, quite logically, that as an industry expands and attendant functions assume such proportions as to engage the full-time attention of the executive, his responsibilities tend to be limited to the exclusive consideration of, for example, Detail Costing, Estimating, Automatic Lathes, Aerodynamics, Drafting, Thermodynamics, etc., etc., and that these duties are of such proportions that not only do they require a special "interest" or "leaning" on the part of the executive in that subject but also a full knowledge, which it is said can be acquired only when a complete training has been devoted to it. Accordingly, the trainee should start to concentrate upon certain subjects very early in his training; towards the end of it should limit his attention to one subject to be his sole occupation. Of course, this pre-supposes that the situation in the industry that is envisaged by the supporters of this idea is one of highly developed and watertight compartments, each department being highly specialised and "minding only its own business," indeed, being able to mind no other business but its own.

Generalisation

Here we have the other extreme. The industrial picture envisaged by the supporters of Generalisation is to a greater extent founded upon experience. They say that their experience has shown that when a particular job is undertaken by a specialised department it may come to a sad end because of certain unforeseen developments—developments which must necessarily be unforeseen because they come under the ægis of another department. They use the argument that if the "specialist" had been more conversant with other processes, the failure would have been obviated. The holders of this opinion have evolved an engineer's training which touches upon all subjects. The phrase "all subjects" is used to include all those that enter, in any way, into the particular branch of engineering concerned, and here the training course embodies everything from the most advanced theory to the most basic workshop practice.

Conclusions and Suggestions

As has been stated, these two schools represent the extremes of the argument. The suggestions which the writer would like to put forward are, it is realised, contentious, yet it would appear that sooner or later some stable plan acceptable to the industry as a whole must be formulated. Excessive specialisation is very likely to cause inefficiencies due to lack of co-operation between departments. The existing type of organisation, in England at least, is centred round the Line and Staff type. It has also been shown that many hold-ups and unnecessary mistakes could have been avoided had there been greater co-operation for instance between Design and Production.

THE STUDENT'S POINT OF VIEW

On the other hand, the most efficient carrying out of respective functions by executives has often been hampered by insufficient knowledge on the part of the executive himself. In other words, we have a situation where the executive is required to know not only more about his own particular subject, but also more about an increasing number of other subjects. The human mind can absorb only a certain amount, and we have not developed into a race of "supermen"; therefore some form of breakdown and differentiation between these specialised subjects is required. It would appear that some study of one particular aspect of a number of specialised subjects should be covered in the engineer's training, that aspect being related to the particular duties the executive is carrying out, or the particular branch in which the student wishes to practise.

The writer would term such breaking down of subjects, "Functionalising," in so far as the student would not specialise on a "water-tight" subject, nor generalise on a large number of subjects imperfectly. He should study the particular aspect of all those branches of engineering which are related to his function. For example, a Design student will want to know about Costing, and so will a Production Engineer, but both these men will require to know different aspects of this one subject—Costing. Therefore, "Costing from the point of view of Design" should be the study of the former, while "Costing for Production" is the aspect of the subject which concerns the latter. This form of breakdown of functionalising of subjects would lessen the already almost overwhelming burden now shouldered by engineering students, and would enable the student to gain a very much more complete knowledge, by eliminating much that in future life he will never require.

Unused Erudition

How often has it been said by engineers to-day that much of what they learnt at their engineering colleges has been forgotten because they have never used it, indeed have never needed to use it? But, do they realise that much of that wasted time could have been spent in the study of some attendant subjects that would have made them very much more efficient engineers to-day? Such functionalising could be applied to all subjects fairly early in the training course, but the basic principles of certain subjects such as Mathematics, would still be taught, so that there would be no fear of missing vital basic knowledge, as might be the result of excessive specialising. Once basic principles have been absorbed, the complete absorption of the applications and more complicated developments is essential. This will not be achieved by specialising and cannot be achieved by overcrowding. It can, however, be carried into effect if only the right and essential aspects of a student's future work are included in his course.

Here then we can satisfy the "Specialists," for our Production Engineer has studied ALL aspects of the function of Production, and is therefore a Specialist. Similarly, we can satisfy the Generalist, for our Design Engineer has studied all the subjects relevant to Design and, therefore, is a good General Engineer.

An argument that might be put forward against functionalising of training is that it would lead to the teaching of an excessive number of subjects in engineering training colleges. However, this argument would not be valid, for, in fact, each lecturer would be required to teach a smaller number of subjects, although the total number of lecturers required would admittedly be greater. This would be a great advantage, in view of the fact that colleges have great difficulty at present in finding lecturers who have sufficient qualifications in all the subjects required. These same lecturers may have fallen victims to the same curse, either specialising in one subject or else having a fairly low standard of general knowledge in many subjects.

Time in Shops

Applied to practical training also this functionalising would help. Instead of a set routine through the shops, different periods of time could be spent in the various departments, the length of stay of each apprentice varying with the practical knowledge of a particular process that he requires. Thus, special departments such as Test House, Research Laboratory, etc., would play a greater or smaller part in the student's training according to his bent. This could also be very well carried out in a form of Apprentices' Workshop in which apprentices would spend the primary part of their training, and where particular aptitudes, such as organisational capabilities, research capabilities, etc., could be more easily discovered. The student's energies can be canalised accordingly.

If we are to see any improvement in the final standard of engineers, we must concentrate on the methods of training and study. If the attendant functions in engineering are growing in number, then it is only logical that a corresponding increase in teaching facilities should be provided. But we cannot increase the student's ability to absorb more and more new subjects, so, in order to prevent complete mental exhaustion we must seek greater division of subjects into general aspects relevant to their functions. The writer feels that only in such a way can we solidly increase the standard of our future engineers.

We can no longer tolerate the situation in which the young engineer, fresh from his training, sees that many of his pet subjects will be unused and likely to go rusty, while at the same time there are openings in many other spheres, indeed a genuine need of men in other spheres, which he cannot fill because of lack of knowledge and the time to acquire it. Such a situation is dangerous to the future of our engineers and a threat to our British engineering industry.

TALK ON TRAINING

MRS. F. G. MILES, of the Miles Aircraft Coy., is to give a talk on "Training Boys and Girls for the Aircraft Industry" at the Women's Engineering Society, 20, Regent Street, London, S.W.1, on Saturday afternoon. The W.E.S. club room will be open at 2.30 p.m., the meeting at which Miss Caroline Haslett, C.B.E., will preside begins at 3 p.m., and tea is to be served at 4.15 p.m.

Mrs. Miles is not only a co-director of the firm with her husband and brother-in-law, but has played a prominent part in the designing of Miles aircraft and has encouraged the training and employment of women in the drawing office and stress department, so her observations will carry the weight of considerable practical experience of her subject.

A.T.C.'s BIRTHDAY

ON February 1st the Air Training Corps was three years old. The 1,743 A.T.C. units all over the country celebrated the Corps' birthday, which coincides with the appointment of Air Marshal Sir Leslie Gossage as its new Chief Commandant.

Many units will hold special church parades next Sunday, February 6th. Messages of congratulations from the Dominions will be read to the cadets on parade.

For many cadets this birthday is their first big Corps occasion, for nearly 100,000 of the older members have now gone into the Services, their places being taken by recruits who have joined during the past year.

R.Ae.S. LECTURE

MR. E. T. JONES, M.Eng., A.F.R.Ae.S., Chief Technical Officer, Boscombe Down, is to lecture before the Royal Aeronautical Society on "Flight Testing Methods" on Thursday, February 10th, 1944.

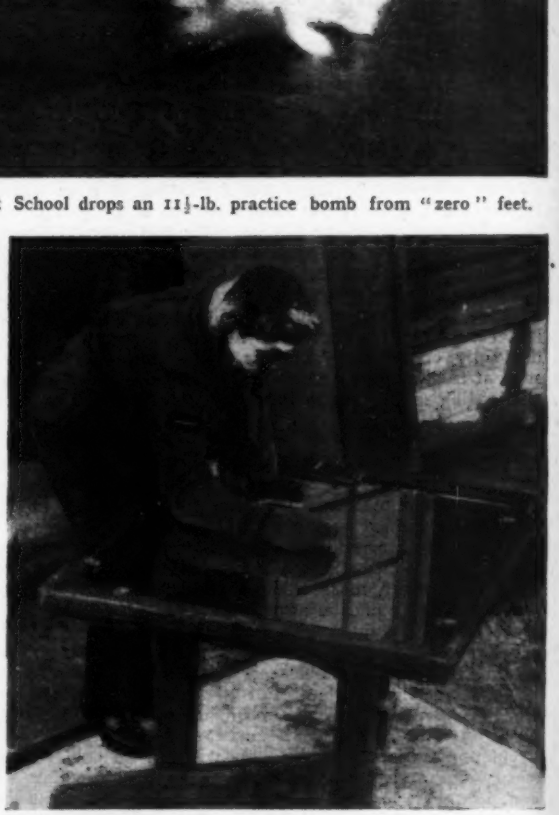
The lecture, illustrated with lantern slides and films, will be at 5.30 p.m. in the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1. Non-members will only be admitted by ticket obtainable through a member.

LOW-LEVEL EXERCISE: A Blenheim of the Air Armament School drops an 11½-lb. practice bomb from "zero" feet.

Training the Air Bomber

Teamwork at the O.T.U.: School for Leadership and Instructors

THERE seems to be a growing impression (or so the authorities believe) that the introduction of path-finders has so simplified the job of the air bomber that the ability to identify a target and aim bombs accurately is nothing like as important as it used to be.



(Above) Sighting on a squared mirror, a W.A.A.F. observer plots the approach of the aircraft on the run-up to its target. (Below) Another W.A.A.F. takes an angle-reading of the actual bomb-burst.

TRAINING THE AIR BOMBER

ATTENTION TO DETAIL: A class of future bombing leaders and air-bomber instructors learns the constructional details of bomb-sights in current use.

Incidentally the term "air bomber" has now officially replaced that of "bomb-aimer."

That the part played by the air bomber, as a member of his team, is just as vital as ever, is demonstrated by the attention paid to his training, not only at the O.T.U.s, but at the Air Armament School, where already experienced air bombers are trained as bombing leaders and instructors in much the same way that the C.G.S. turns out gunnery leaders and instructors.

A considerable part of Flying Training Command's efforts are devoted to acclimatising to conditions in this country pilots and aircrew who have qualified at Empire Air Training Scheme schools in the much easier weather conditions generally found in the Dominions. So far as the air bomber is concerned, the O.T.U. also gives him training as a member of a bomber team for ultimate posting to an operational squadron. In that team he is very much of an all-rounder since he must also be able to man a gun-turret in emergency to help the navigator with map reading, taking astro-sights, etc., be responsible for getting photographs of the attack, be proficient in aircraft recognition, know something about signals and reconnaissance, and even help the wireless operator.

"A MOUNTAIN LABOURED——": The sand-filled practice bomb, being dropped from 11,000ft., looks a very small egg for a Wimpey to lay.

EXTREME MEASURES: Men who have learnt to score bulls with 20-lb. bombs will make sure their 4,000-lb. block-busters land in the right places.

Advanced Instruction

That pathfinders may guide his aircraft to the target area with their flares does not, therefore, relieve him of his responsibilities, and proper bomb aiming is just as important as ever. In any case, many air bombers are required for operations in which pin-point bombing is essential. The difference between doing all this under clear Canadian skies and in the varied degrees of visibility encountered in Northern Europe can readily be imagined.

At the Air Armament School, most of the "pupils" are air bombers who have displayed qualities of leadership while on operational sorties. Here they receive advanced instruction, and return to their squadrons as bombing leaders with the responsibility of keeping their fellow air bombers up to concert pitch. Suitable types will be selected for a special course in the technique of teaching others and will become air bomber instructors at A.F.U.'s and O.T.U.'s. During their course at the Air Armament School, all air bombers get regular practice in Blenheims, using 11½ lb. practice bombs on raft targets moored just off the coast.

The Air Armament School is commanded by Group Captain T. S. Ivens, and its history dates to 1922, when it was formed at Eastchurch. It remained there until 1938 when the needs of R.A.F. armament as a whole brought about its removal to the spacious premises and facilities it now enjoys.

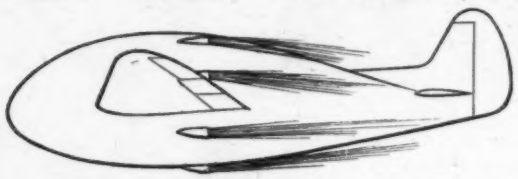
CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

JET PROPULSION FOR AIRCRAFT

Alternative Application Suggested

THREE years ago the Government asked for suggestions *re* defence from German bombers. I wrote to them suggesting flares 20,000ft. to 30,000ft. high to show up the bombers to our night fighters. The Government must have thought it no good, although the Germans must think it good. If we had had the flares at the time of the blitzes we should have brought



down a lot more Germans. Now about the jet aircraft. Instead of the jets coming out of the tail, shape the aircraft like an orange pip and have several jets coming out of the shoulders, pressing air against and all round the fuselage, when the aircraft will shoot forward twice as quickly on only half the power. Pass this on if you think anything of it.

E. H. MILES.

Two Efficiency Factors

MANY of your readers were probably as interested as I was in the explanation of jet-propulsion efficiency provided by De Havillands in the latest of their "Even I Can Understand" series. Unfortunately, for once I cannot understand, and at the risk of going to the bottom of the class I seek some enlightenment.

It is asserted that the limiting efficiency is controlled by the ratio (R) of slip/forward speed, through the formula $E = \frac{2}{2+R}$, but surely the *propulsion* efficiency with which the article dealt is only one of two main factors constituting the real overall efficiency of an aircraft. The other, and certainly not less important factor, is the thermal and mechanical efficiency of the power plant displayed in converting the potential energy of fuel into the kinetic energy of thrust. It seems to me that a screw-driven aircraft may well pay heavily for its low R figure, for to achieve that low ratio it must employ a very high engine power (using a far from efficient example of the heat engine) in conjunction with a coarse-pitch propeller, otherwise forward speed must suffer. Use that same power, however, in a jet-propelled aircraft, *and notwithstanding that the ratio R may now rise to anything over* 1.0, yet still the jet-propelled aircraft may fly the faster of the two. That surely is the only criterion of the relative efficiency of the two systems. The argument applies equally well in the extreme analogy of the barge mentioned in the article, although it must necessarily employ equally extreme assumptions. What though the forward speed is 1 m.p.h. and the jet slip 1,000 m.p.h.—if that jet unit uses less fuel than the horse that normally tows the barge at 1 m.p.h., then it must be more efficient.

Can I still go on reading the series, or is it back to the kindergarten and a paper kite for me?

H. G. PUTTICK.

Possibilities in Boundary-layer Control

GERMAN views on assisted take-off, published in *Flight* on December 30th last, by no means exhaust the possible methods of attaining this end.

Boundary layer control, by suction, applied to the air flowing over the cambered surfaces of the fuselage and wings is yet another method, which not only assists the take-off; it also presents a more normal solution without loose and detachable odds and ends.

The scavenging of the boundary layer takes place through a number of openings or slots located on the fuselage or wings near the point where separation occurs and turbulence begins, and practically eliminates turbulent air flow with its enhanced drag; as a result the lift is considerably increased and the drag is reduced almost to vanishing point.

The quantity of air to be removed in this way, at 200 m.p.h., is of the order of 1¼ cu. ft./sq. ft. of wing area per second, and it has been proposed to use a fan or a compressor to carry out the operation, but this entails extra weight, equipment, and fuel. When, however, the slots are connected to the intake of a jet propulsion engine, the whole aspect of the proposition is changed and a new field of development is opened. Such an engine might use, say, 850 cu. ft. of air per second, which would successfully scavenge an area of 700 sq. ft.

Furthermore, when the ducts or pipes connecting the openings to the intake of the jet propulsion engine are arranged with a 30 degree elbow pointing backwards, a resultant reaction occurs on the outer wall of the bend, a component force of which is of the order of 600 lb. and acts as a propelling force on the aircraft.

This combination of high lift (which would almost be high enough to raise a fighter off the deck of an aircraft carrier), together with the primary and secondary propulsive forces, and the reduction in drag would improve the all-round performance of the machine.

The reduction in drag to the region of zero opens up the way to phenomenal speeds, and perhaps even ballistic velocities would eventually be attained.

When landing, the total weight would have been reduced by the weight of fuel consumed during the journey, and landing would be a normal procedure. NE FRONTE CREDE.

TYPHOON v. JUNGMANN

Manœuvrability Spells Safety

I CANNOT allow Mr. Alexander's letter to pass without comment, regarding immunity of low speed and "ultra-manœuvrable" aircraft from the attacks of high-speed fighters. The fact that most of his deductions have been drawn from the events of the Spanish War tends to put his ideas a little out of date.

The high-speed aircraft of those days certainly bear no comparison to what we regard as high speed to-day. Furthermore, A.O.P. pilots of the "ultra-manœuvrable" light plane of which class the Taylorcraft Auster is a notable example, have developed a technique based upon this very feature of low-speed manœuvrability which can be relied upon to get them out of trouble in an encounter with a really high-speed fighter.

We will take the case of two aircraft, one of high speed and high loadings and one of low speed and low loadings. We will assume that both machines in the course of an encounter are put into a 4G turn. In the same length of time the high-speed fellow will still be endeavouring to complete a circle whilst the low-speed man has completed several. These circumstances are invariably made use of, and in the case of ground contours, buildings, trees, etc., something of a similar nature happens in the vertical plane, which still gives the low-speed man an excellent chance, even should he find himself right in the track of a high-speed fighter, for there is a limit to how low the high-speed fighter is able to fly in order that his guns may be trained on to a dodging or really low-flying aircraft.

In substantiation of these views, I may add that my duties include flying both the Typhoon and Taylorcraft Auster, and when I have flown in mock-combat from the seat of either machine, I have been able to assess values to the conclusion that in defensive tactics, the low-speed "ultra-manœuvrable" aircraft is more than a match for the high-speed fighter.

It further explains how on one occasion nine Messerschmitts set upon a lone Auster and failed to register a single hit, and also accounts for the extremely low losses suffered by the Taylorcraft Auster throughout the Middle East campaigns.

I am convinced that the Germans are not loth to fly low down under any conditions and that it is purely a question of manœuvrability and the high degree of skill of the A.O.P. pilots which has given the Auster such outstanding success.

CHIEF TEST PILOT,
Taylorcraft Aeroplanes (England), Ltd.

Gas Turbines and Jet Propulsion for Aircraft
By G. GEOFFREY SMITH, M.B.E.
A second edition of the above booklet is now available from "Flight" publishing offices. The new work consists of ten chapters and includes many illustrations. Price 3/6 plus 3d. post.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

The tricycle undercarriages and negative dihedral wing sections give a queer stance to a line of Mitchells taxying on the perimeter track.

Promotions

R.A.F.

GENERAL DUTIES BRANCH.

Air Commodores are granted the rank of Air Vice-Marshal (temp.), December 1st, 1943:—
B. McENTEGART, C.B.E.
H. S. KERBY, C.B., D.S.C., A.F.C. (Act. Air Vice-Marshal).
A. P. M. SANDERS, C.B.E. (Act. Air Vice-Marshal).
A. B. RICE, C.B., C.B.E., M.C. (Act. Air Vice-Marshal).
R. HARRISON, C.B.E., D.F.C., A.F.C. (Act. Air Vice-Marshal).
A. C. COLLIER, C.B., C.B.E. (Act. Air Vice-Marshal).
W. F. DICKSON, C.B., D.S.O., O.B.E., A.F.C. (Act. Air Vice-Marshal).
W. ELLIOT, C.B., C.B.E., D.F.C.
J. W. BAKER, C.B., M.C., D.F.C. (Act. Air Vice-Marshal).
H. S. P. WALMSLEY, C.B.E., M.C., D.F.C. (Act. Air Vice-Marshal).
A. B. ELLWOOD, C.B., D.S.C. (Act. Air Vice-Marshal).

Group Captains are granted the rank Air Commodore (temp.), December 1st, 1943:—
W. E. G. BRYANT, M.B.E.
E. I. BUSSELL.
P. R. T. J. M. I. C. CHAMBERLAYNE, A.F.C.
C. G. WIGGLESWORTH, A.F.C.
G. G. BANTING, C.B.E.
A. M. WRAY, D.S.O., M.C., D.F.C., A.F.C.
N. L. DESOER.
C. A. BOUCHIER, C.B.E., D.F.C.
G. S. HODSON, C.B.E., A.F.C.
L. F. PENDRED, M.B.E., D.F.C.
B. E. EMBRY, D.S.O., A.F.C., A.D.C. (Act. Air Vice-Marshal).
H. A. HAINES, C.B.E., D.F.C.
J. N. BOOTHMAN, A.F.C.
R. L. RAGG, A.F.C.
W. L. DAWSON, C.B.E.
G. HARCOURT-SMITH, C.B.E., M.V.O.
G. H. MILLS, D.F.C.

TECHNICAL BRANCH.

Air Comdre. (Act. Air Vice-Marshal) G. G. DAWSON, C.B., C.B.E., is granted the rank of Air Vice-Marshal (temp.), December 1st, 1943.

Group Captains are granted the rank of Air Commodore (temp.), December 1st, 1943:—
H. E. FORROW, O.B.E.
K. L. BOSWELL, C.B.E.
F. E. VERNON, O.B.E.
E. H. RICHARDSON.
E. B. ADDISON, C.B.E.
E. G. HART, O.B.E., M.C.

EQUIPMENT BRANCH.

Group Captains are granted the rank of Air Commodore (temp.), December 1st, 1943:—
H. L. WOOLVERIDGE, O.B.E.
A. E. SUTTON-JONES.
F. N. TRINDER.

ACCOUNTANT BRANCH.

Group Captains are granted the rank of Air Commodore (temp.), December 1st, 1943:—
P. J. WISEMAN.
H. F. FULLER.

A.A.F.

BALLOON BRANCH.

Group Capt. W. C. C. GELL, D.S.O., M.C., T.D., D.L., is granted the rank of Air Commodore (temp.), December 1st, 1943.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Act. Wing Cdr. G. K. LAWRENCE, D.F.C., R.A.F.O., No. 78 Sqn.—Since being awarded the D.F.C. this officer has completed many sorties, including attacks on such targets as Berlin, Hanover, Kassel and Milan. Wing Cdr. Lawrence has invariably pressed home his attacks with great determination, and his fearless example has inspired all. In addition, Wing Cdr. Lawrence has devoted much energy to the training of other air crews, and the successes achieved are an excellent tribute to his great skill and untiring efforts.

Act. Flt. Lt. G. DE L. CARVER, D.F.C., R.A.F.V.R., No. 73 Sqn.—This officer has completed a large number of sorties, many of them in the Middle East. He is an ideal leader, whose great skill and tenacity of purpose have always been evident. His determination was well demonstrated on a recent occasion during an operation against Mannheim. In the early stages of the outward flight some equipment became unserviceable and, some time later, the aircraft was hit by anti-aircraft fire, which badly damaged the hydraulic gear. In spite of this, Flt. Lt. Carver flew on to the target and pressed home a determined attack.

Act. Wing Cdr. D. CROWLEY-MILLING, D.F.C., R.A.F.V.R.—This officer has been actively engaged in operational flying since the beginning of the war. Since the award of a bar to the D.F.C. he has taken part in many bombing attacks on enemy airfields in the occupied countries, and has shown himself at all times to be a cool and determined leader, exhibiting the highest skill and tenacity on operations.

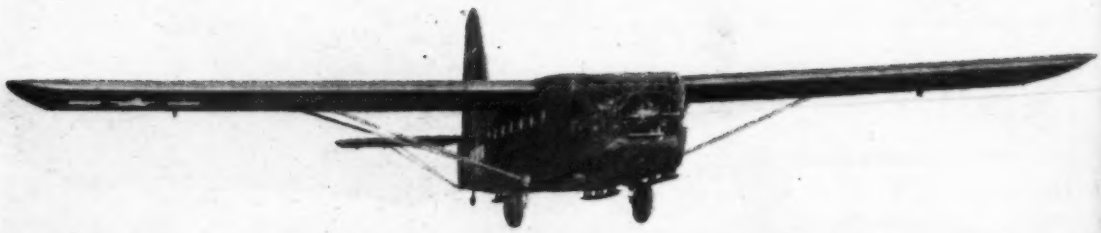
Wing Cdr. R. C. LOVE, D.F.C., R.A.F.—This officer commanded the R.A.F. units which operated from the Island of Cos. From the airfield at Antimachia he directed all the air and ground defences and also the air transport operations. The airfield was daily subjected to heavy bombing and machine gun attacks. In spite of this and other difficulties, Wing Cdr. Love built up and maintained an efficient organisation, and it was primarily due to his outstanding leadership, great drive and devotion to duty that the fighter squadrons and other defences were able to maintain their aircraft and guns in constant action against the enemy. Later, when compelled to withdraw by greatly superior invading forces, Wing Cdr. Love successfully organised the evacuation from the airfield in spite of harassing circumstances.

Wing Cdr. D. C. SMITH, D.F.C., R.A.F.O., No. 76 Sqn.—In operations in the Middle East Wing Cdr. Smith completed a very large number of sorties. More recently he has participated in numerous attacks on targets in Germany, including such centres as Berlin, Stuttgart, Kassel and many others equally important. He has at all times displayed exceptional skill, great courage and resolution, and his achievements have been worthy of high praise.

Act. Sqn. Ldr. R. H. ANNAN, R.A.F.V.R., No. 115 Sqn.—This officer has completed a very large number of sorties, many of them in the Middle East, where he attacked a wide variety of targets. Latterly, Sqn. Ldr. Annan has participated in many sorties over Germany, including attacks on Stuttgart, Hanover and Berlin. He is an outstanding captain, whose skill, courage and devotion to duty have been reflected in the success of the flight he commands.

Act. Sqn. Ldr. C. B. J. PORTER, D.F.C., R.A.F.V.R., No. 51 Sqn.—As flight commander Sqn. Ldr. Porter has completed much operational flying

Air Chief Marshal Sir Arthur and Lady Tedder arrive back in England by D.C.3.



The new American YCG-13 glider. It is reported to carry a load of more than 8,000 lb.

SERVICE AVIATION

and has a fine record. By his great skill and efficiency he has contributed in a large measure to the excellent results achieved in attacks against Berlin, Hamburg and the Ruhr area. Sqn. Ldr. Porter's dogged determination, fearlessness and devotion to duty have proved most inspiring to all with whom he has flown.

Bar to Distinguished Flying Cross

Act. Flt. Lt. J. H. DOUGLAS, R.A.F.V.R., No. 458 Sqn.—A first-class operational pilot, this officer has completed many operational sorties. He has shown exceptional ability as a flight commander, and under his leadership the flight has attained a high standard of efficiency. In July, 1943, when on patrol he sighted a large enemy merchant vessel which he attacked successfully.

Flt. Lt. G. N. BARGATE, D.F.C., R.A.F.V.R., No. 223. Sqn.—In October, 1943, Sqn. Ldr. King and Flt. Lt. Bargate were pilot and observer respectively of the leading aircraft of a bomber force detailed to attack a target. When nearing the target the aircraft was hit by anti-aircraft fire and sustained serious damage. Flt. Lt. Bargate was wounded in the neck and face. Although bleeding profusely and temporarily blinded in one eye, he guided his pilot to the objective and bombed it. Afterwards, Sqn. Ldr. King, although almost overcome by fumes from the petrol which streamed from the pierced tanks, battled on through intensive anti-aircraft fire to reach our own lines.

Act. Sqn. Ldr. E. C. BADCOE, D.F.C., R.A.F.V.R., No. 77 Sqn.—One night in November, 1943, this officer piloted an aircraft detailed to attack Dusseldorf. When nearing the target, the aircraft was attacked by a fighter. The bomber was hit by machine gun fire from the enemy aircraft and temporarily went out of control. Sqn. Ldr. Badcoe regained control, however, and then went on to the target and executed a vigorous attack, afterwards flying the damaged bomber to base.

Act. Sqn. Ldr. N. J. BENNETT, D.F.C., R.A.F.V.R., No. 76 Sqn.—Sqn. Ldr. Bennett is an outstanding flight commander, whose example of courage, determination and devotion to duty has been of a high order. Since being awarded the D.F.C. he has completed very many sorties and his great skill has been an important factor in the successes obtained. Sqn. Ldr. Bennett has rendered valuable service.

Act. Sqn. Ldr. L. R. RATCLIFF, D.F.C., A.F.C., R.A.F.V.R., No. 161 Sqn.—Since being awarded the D.F.C., this officer has completed many sorties and has achieved much success. He is a most efficient flight commander, whose keenness and devotion to duty have been unfailing. On one occasion, Sqn. Ldr. Ratcliff was detailed for an important sortie. When passing over the enemy coast he experienced engine trouble. Nevertheless, Sqn. Ldr. Ratcliff went on to the target and successfully carried out the operation, afterwards flying on to North Africa to make a safe landing.

Act. Flt. Lt. L. G. A. REED, D.F.C., R.A.F., No. 161 Sqn.—This officer has taken part in numerous sorties, many of which have demanded a high degree of skill and determination. He is a highly efficient member of aircraft crew and his example of coolness and courage has been highly commendable. Flt. Lt. Reed has also rendered valuable service in the training of other members of the squadron.

Act. Sqn. Ldr. K. A. FAULKNER, D.F.C., R.A.F.V.R., No. 252 Sqn.—Since being awarded the D.F.C. this officer has participated in numerous sorties and his great skill and fine fighting qualities have been amply demonstrated on many occasions. In September, 1943, he led a formation of aircraft in an attack on a heavily armed and escorted enemy convoy near Amorgos Island. In the engagement Sqn. Ldr. Faulkner attacked an Arado 196, which he forced down on to the sea, and afterwards attacked a merchant ship and an escorting vessel.

Act. Flt. Lt. J. C. THELWELL, D.F.C., R.A.F.V.R., No. 105 Sqn.—Flt. Lt. Thelwell is a skilful and resolute captain who has completed very many successful sorties. One night in November, 1943, he piloted an aircraft detailed to attack Dusseldorf. Early on the outward flight a technical failure caused engine trouble. In spite of this, Flt. Lt. Thelwell went on to the target and, in the face of heavy opposition, executed a successful attack.

Flt. Lt. J. MOSS, D.F.C., R.A.F.V.R., No. 680 Sqn.—This officer has completed a very large number of reconnaissances and has displayed exceptional skill and great devotion to duty. In October, 1943, Flt. Lt. Moss successfully completed a reconnaissance over an area near Cos Island, obtaining valuable information. Some days later he undertook a similar mission in the Dodecanese area. In spite of heavy and accurate anti-aircraft fire, Flt. Lt. Moss persisted in his task and secured highly important information.

Act. Sqn. Ldr. A. E. MILLSON, D.F.C., R.A.F.V.R., No. 102 Sqn.—Since being awarded the D.F.C. Sqn. Ldr. Millson has participated in very many sorties, involving attacks on a variety of targets. He has displayed great keeness throughout and his successes are an excellent tribute to his skill and resolution.

Act. Sqn. Ldr. G. W. NORTHCOTT, D.F.C., R.C.A.F., No. 402 (R.C.A.F.) Sqn.—Since being awarded the D.F.C. this officer has participated in a large number of sweeps during which he has destroyed four enemy aircraft, bringing his victories to at least nine destroyed. Sqn. Ldr. Northcott's fine fighting spirit has been an inspiration to all members of the squadron be commands.

Act. Wing Cdr. S. N. L. MAUDE, D.F.C., R.A.F.O.—During his tours of operational duty this officer has, by his personal example and efficiency, raised the standard of the squadron to its present pitch. Wing Cdr. Maude has taken part in many patrols and has attacked enemy locomotives, railway and industrial targets. At all times his courage, cheerful confidence and devotion to duty have been most praiseworthy.

F/O. G. A. TURNER, D.F.C., R.A.F.V.R., No. 107 Sqn.—Since the award of the D.F.C. this officer has completed a large number of sorties against the enemy, including both low and high level attacks. He has shown exceptional eagerness to engage the enemy and all his attacks have been outstandingly successful. In August, 1943, he was leader of a formation detailed to attack an important objective in France. Soon after crossing the enemy coast the formation was attacked by fighters. Though the attacks continued until the target was reached F/O. Turner allowed nothing to deter him from the accurate completion of his mission. He dropped his bombs in the face of intense opposition from the ground, returning safely to base.

Miss Diana Barnato, of A.T.A., climbs aboard a Spit IX to take it to its service station. Miss Barnato is a daughter of Wing Cdr. Woolf Barnato.

Distinguished Flying Cross

Act. Sqn. Ldr. H. J. KING, D.F.M., R.A.F.V.R., No. 223 Sqn.—For citation see Flt. Lt. Bargate, D.F.C. and Bar.
W/O. D. R. FIELDHOUSE, R.A.F., No. 207 Sqn.
W/O. W. J. LOVE, R.A.A.F., No. 156 Sqn.
W/O. G. F. D. MURRAY, R.C.A.F., No. 35 Sqn.
Act. W/O. W. C. H. MUNSCH, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
Act. Wing Cdr. J. F. SUTTON, A.F.C., R.A.F.O., No. 10 Sqn.
Act. Wing Cdr. A. G. WILSON, R.A.F.O., No. 487 (N.Z.) Sqn.
Act. Sqn. Ldr. W. H. MAGUIRE, R.A.F.V.R., No. 85 Sqn.
Flt. Lt. J. R. D. DENNEHEY, R.A.F.V.R., No. 164 Sqn.
Act. Flt. Lt. G. ELCOMBE, R.A.F.V.R., No. 66 Sqn.
F/O. A. R. B. BELLIS, R.C.A.F., No. 422 (R.C.A.F.) Sqn.
W/O. W. F. BEALS, R.C.A.F., No. 422 (R.C.A.F.) Sqn.
W/O. W. COOK, R.A.F.V.R., No. 164 Sqn.
F/O. G. H. WARD, R.A.F.V.R., No. 158 Sqn.
P/O. T. J. BISHOP, R.A.F.V.R., No. 51 Sqn.
Act. Sqn. Ldr. J. C. COOPER, R.A.F.V.R., No. 78 Sqn.
Flt. Lt. A. G. DECK, R.A.F.V.R., No. 227 Sqn.
Act. Flt. Lt. J. MONTGOMERY, R.A.F.V.R., No. 78 Sqn.
P/O. C. M. BOUNEVIALLE, R.A.F.V.R., No. 227 Sqn.
W/O. D. E. WARNE, R.C.A.F., No. 227 Sqn.
P/O. D. A. ROLLIN, R.A.F.V.R., No. 44 Sqn.
W/O. H. R. COOKE, A.A.F., No. 619 Sqn.
Sqn. Ldr. B. A. EATON, R.A.A.F., No. 3 Sqn.
Act. Sqn. Ldr. H. SHANNON, R.A.F.V.R., No. 236 Sqn.
Act. Flt. Lt. J. S. KNOX, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt. A. SIBEL, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt. F. S. SMITH, R.C.A.F., No. 158 Sqn.
F/O. J. R. G. BATHGATE, R.N.Z.A.F., No. 161 Sqn.
F/O. R. BURR, R.A.F.V.R., No. 44 Sqn.
P/O. W. BEAUMONT, R.A.F.V.R., No. 158 Sqn.
P/O. H. N. MOTTERSHEAD, R.A.F.V.R., No. 158 Sqn.
Act. Sqn. Ldr. H. B. ATKINSON, R.A.F.V.R., No. 603 Sqn.
Act. Flt. Lt. J. J. JAGGER, R.A.F.V.R., No. 35 Sqn.
F/O. C. G. ADAMS, R.A.F.V.R., No. 47 Sqn.
P/O. J. FINDING, R.A.F.V.R., No. 83 Sqn.
P/O. R. H. GILES, R.A.F.V.R., No. 603 Sqn.
P/O. K. I. E. HOPKINS, R.A.A.F., No. 603 Sqn.
P/O. H. A. TAYLOR, D.F.M., R.A.F.V.R., No. 35 Sqn.
W/O. C. F. LALOLI, R.N.Z.A.F., No. 30 Sqn.
Flt. Lt. P. G. BROWN, R.A.F.V.R., No. 178 Sqn.
Flt. Lt. G. G. TOZER, R.A.F.V.R., No. 680 Sqn.
Act. Flt. Lt. E. T. HODGKINSON, R.A.F.V.R., No. 57 Sqn.
Flt. Lt. R. P. DRUMMOND, R.A.F.O., No. 220 Sqn.
Act. Flt. Lt. W. G. W. WARREN, R.A.F.V.R., No. 77 Sqn.
P/O. W. H. BAKER, R.A.F.V.R., No. 207 Sqn.
F/O. E. ELLISON, R.A.F., No. 680 Sqn.
F/O. W. E. G. HUMPHREY, R.A.F.V.R., No. 105 Sqn.
P/O. H. A. L. ELLIS, R.A.A.F., No. 77 Sqn.
P/O. H. W. MITCHELL, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
Act. Wing Cdr. D. R. WALKER, R.A.F.O., No. 182 Sqn.
Flt. Lt. T. J. BUDDLE, R.A.F.V.R., No. 155 Sqn.
Flt. Lt. G. J. GRAY, R.A.F.V.R., No. 247 Sqn.
Flt. Lt. D. WINTON, R.A.F.V.R., No. 155 Sqn.

P/O. D. STILLIARD, R.A.F.V.R., No. 20 Sqn.
P/O. R. C. CHATFIELD, R.A.F.V.R., No. 107 Sqn.
P/O. A. LIDDLE, D.F.M., R.A.F.V.R., No. 107 Sqn.
Act. Sqn. Ldr. P. G. A. HAEVEY, No. 102 Sqn.
Flt. Lt. I. J. HARTLEY, R.A.F.V.R., No. 102 Sqn.
Flt. Lt. P. K. B. WILLIAMS, R.A.F.V.R., No 7 Sqn.
P/O. G. M. BOWMAN, R.A.F.V.R., No. 10 Sqn.
P/O. F. A. P. HOSKINS, R.A.F.V.R., No. 102 Sqn.
P/O. J. S. LEES, R.C.A.F., No. 50 Sqn.
P/O. T. TOPHAM, R.A.F.V.R., No. 102 Sqn.
P/O. E. B. GOODALL, R.A.F.V.R., No. 10 Sqn.
P/O. H. L. MACKAY, R.A.F.V.R., No. 102 Sqn.
P/O. A. C. SMART, R.A.F.V.R., No. 158 Sqn.
Sqn. Ldr. J. B. SELWAY, A.A.F., No. 85 Sqn.
Act. Sqn. Ldr. R. F. ROBINSON, R.A.F.V.R., No. 157 Sqn.
Act. Flt. Lt. V. C. FITTALL, R.N.Z.A.F., No. 198 Sqn.
Act. Flt. Lt. D. MIDGLEY, R.C.A.F., No. 15 Sqn.
Act. Flt. Lt. D. R. SCOTT, R.A.F.V.R., No. 15 Sqn.
W/O. S. R. GRANT, R.A.F.V.R., No. 218 Sqn.

Conspicuous Gallantry Medal (Flying)

Sgt. J. W. NORRIS, R.A.F.V.R., No. 61 Sqn.—This airman was the flight engineer of an aircraft detailed to attack Dusseldorf. Soon after crossing the enemy coast, the aircraft was attacked by a fighter and sustained damage. A few minutes later another fighter attacked. The bomber was struck by a hail of bullets. The windscreen was broken, the wireless apparatus and other important equipment were destroyed, and the oxygen system was rendered useless. The pilot, the wireless operator and the flight engineer were wounded and the navigator was killed. The aircraft became difficult to control, but, despite this, the pilot continued to the target, being greatly assisted by Sgt. Norris, whose strenuous efforts were invaluable. Shortly after the target had been successfully attacked, the pilot collapsed owing to his wounds. Sgt. Norris took over the controls and, at times aided by another member of the crew, succeeded in flying the damaged bomber to this country. When an airfield was sighted, Sgt. Norris and his comrade succeeded in rallying the semi-conscious pilot sufficiently to take over and land the aircraft safely. Not until then did Sgt. Norris disclose that he had been wounded in the arm.

Distinguished Flying Medal

Sgt. L. J. QUAITE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Sgt. W. R. TYRIE, R.A.F.V.R., No. 619 Sqn.
Sgt. D. WALTON, R.A.F.V.R., No. 619 Sqn.
Sgt. R. I. WOOLMER, R.A.F.V.R., No 156 Sqn
Sgt. W. R. DOHERTY, R.A.F., No. 102 Sqn.
Sgt. J. NORRIS, R.A.F.V.R., No. 158 Sqn.
Sgt. H. J. VAN DER POL, R.A.F., No. 38 Sqn.
Flt. Sgt. H. V. BORROWDALE, R.A.F.V.R., No. 47 Sqn.
Flt. Sgt. S. G. MATHESON, R.C.A.F., No. 44 Sqn.
Sgt. G. T. CRAVEN, No. 47 Sqn.
Sgt. G. C. HARRIS, R.A.F.V.R., No. 76 Sqn.
Sgt. H. A. MILNE, R.A.F.V.R., No. 47 Sqn.
Flt. Sgt. G. W. BURNESS, R.N.Z.A.F., No. 44 Sqn.
Sgt. T. H. MCSHANE, R.A.F., No. 214 Sqn.
Sgt. P. STUART, R.A.F.V.R., No. 428 (R.C.A.F.) Sqn.
Sgt. A. C. YULE, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Sgt. G. S. SPENCER, R.A.F.V.R., No. 38 Sqn.
Flt. Sgt. W. W. DODSWORTH, R.A.A.F., No. 199 Sqn.
Flt. Sgt. R. A. LEARMONTH, R.A.A.F., No. 619 Sqn.
Flt. Sgt. B. J. MCOWAN, R.A.F.V.R., No. 178 Sqn.
Flt. Sgt. J. J. TAYLOR, R.A.F., No. 20 Sqn.
Flt. Sgt. (now P/O.) P. B. WHARTON, R.A.F.V.R., No. 95 Sqn.
Sgt. W. MCTAGGART, R.A.F., No. 204 Sqn.
Sgt. D. G. ROGORA, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. J. WHITE, R.A.F.V.R., No. 630 Sqn
Flt. Sgt. J. T. PAGE, R.A.F.V.R., No. 169 Sqn.
Flt. Sgt. C. H. PEARCE, R.A.F.V.R., No. 83 Sqn
Flt. Sgt. E. MCK. P. ROSIE, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. J. SIMKIN, R.A.F.V.R., No. 619 Sqn.
Flt. Sgt. J. W. THOMPSON, R.A.F.V.R., No. 50 Sqn. (since deceased).
Flt. Sgt. E. B. TAYLOR, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. W. D. G. WILKES, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. L. WOOD, R.A.F.V.R., No. 166 Sqn.
Sgt. C. J. ADAIR, R.A.F., No. 101 Sqn.
Sgt. G. F. BRICE, R.A.F.V.R., No. 166 Sqn.
Sgt W. CORNWALL, R.A.F.V.R., No. 158 Sqn.

THE KING has been graciously pleased, on the advice of His Majesty's Canadian Ministers, to approve the following award:—

M.B.E. (Mil.)

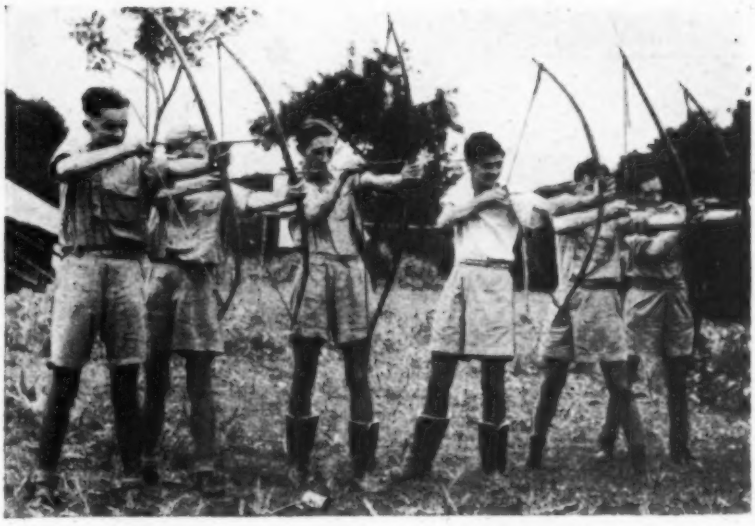
W/O. 1st Cl. N. D. SMITH, R.C.A.F.

THE KING has been graciously pleased to approve the following awards:—

Military Cross

Flt. Lt. R. J. L. FERRIS, M.B., B.Ch., R.A.F., No. 74 Sqn.

Flt. Lt. Ferris, the medical officer of No. 74 Sqn., has displayed outstanding gallantry and devotion to duty. During a period in October, 1943, his headquarters was subjected to severe enemy air attacks. On one occasion four men were killed and two others were buried under the debris. Flt. Lt. Ferris immediately set to work removing the bodies and releasing the buried men. His medical equipment had been destroyed, and he was compelled to work with a pair of scissors and a small wood saw, with which he succeeded in releasing one man after amputating his leg. Flt. Lt. Ferris accomplished this while the air attack was in progress, and worked with very little light and while held upside down by his legs. During an engagement between British and enemy ground forces he treated military and civilian casualties alike. Flt. Lt. Ferris worked incessantly under most rigorous conditions. His coolness and courage proved a source of inspiration to all.



Pulling the long-bow. Pilots on the Burma front pass their time with a little toxophilitic amusement.

Air Force Cross

Sqn. Ldr. W. G. PATE, R.C.A.F.
P/O. A. MacK. JAMES, R.C.A.F.

Roll of Honour

Casualty Communiqué No. 339.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 97 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. H. V. Birch; P/O. K. J. Mears; Sgt. L. Pearce; W/O. H. G. Richardson; P/O. G. G. Salt; F/O. D. M. Stewart.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. C. Balsdon; W/O. D. C. C. Busby, G.M.; Sgt. A. H. Clark; Sgt. L. Gill; Sgt. J. M. Hadfield; Flt. Sgt. K. Hall; Sgt. J. S. Harris; Sgt. L. M. Lack; Sgt. A. J. L. Lyon; Sgt. R. Martin; Sgt. G. M. Murray; Act. Flt. Lt. J. W. Potts; F/O. N. J. Stanford; Sgt. W. Woodland.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. Andrew; Flt. Sgt. W. F. Austin, D.F.M.; Sgt. D. Ansley; Sgt. K. F. Bartholomew; F/O. P. J. C. Bateman-Champain; Sgt. A. E. Beaven; Sgt. C. S. Berger; Sgt. W. S. Berry; P/O. C. O. Bramham; Sgt. H. D. Brown; Sgt. L. C. Cameron; Sgt. E. D. Cook; Sgt. D. J. Cooper; Sgt. A. J. Crosson; Sgt. B. Elwell; Sgt. L. L. Everden; F/O. E. S. Garai; Sgt. R. T. C. Green; Sgt. F. V. Harrison; Sgt. P. J. Haseman; Sgt. T. E. Hastings; Sgt. F. Hawes; Sgt. E. T. R. Howard; Sgt. J. G. Hubbard; Sgt. H. E. Jeffreys; Sgt. A. Jones; Sgt. S. W. Kennedy; Sgt. N. A. Lever; Sgt. A. Lucas; F/O. G. D. A. Lundon; Sgt. W. H. Macklin; F/O. L. J. McCullock; Sgt. A. McVicar; Sgt. R. A. Mears; Sgt. M. W. Metcalfe; Flt. Sgt. C. H. Newman; Sgt. E. Parry; F/O. A. W. J. Piers; Sgt. R. L. Pierson; Sgt. F. J. Platt; Sgt. W. M. Robertson; F/O. R. P. Sage; Sgt. D. S. Saunders; Flt. Lt. C. L. Selman, D.F.C.; Sgt. L. Shepherd; Sgt. T. G. Shergold; Sgt. L. R. J. Shrubsall; Sgt. A. Skelly; F/O. K. F. Smart; Flt. Sgt. A. F. Smith; Flt. Sgt. D. E. Street; Sgt. R. H. G. Taylor; Sgt. J. E. Turnbull; Sgt. D. Vollans; Sgt. D. N. D. Waite; Sgt. R. F. Wanstall; Sgt. J. A. White; Sgt. A. W. E. Wilson; Sgt. D. C. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. W. Blondell; P/O. F. Markham; Sgt. A. H. Wilcher.

MISSING.—Sgt. G. H. Austin; Sgt. H. G. Bannister; F/O. S. J. P. Blackwell; F/O. J. Brothwell; Sgt. F. W. Boddy; Act. Flt. Lt. E. J. Clement, D.F.C.; Sgt. F. B. Collenet; Sgt. D. R. Comber; Flt. Sgt. W. C. Connor; Sgt. R. W. McG. Cowan; Act. Sqn. Ldr. A. S. Cussens; Sgt. F. J. Davidson; Sgt. P. J. Deveney; Sgt. G. B. Dickson; Sgt. C. H. Downs; Sgt. E. H. G. Dyer; Sgt. J. B. Errington; P/O. H. F. Farley; Flt. Sgt. C. R. Farman; Sgt. R. L. Gill; Flt. Sgt. G. H. Gittins; Sgt. S. H. Godfrey; Flt. Sgt. G. C. Harper; Sgt. L. S. Harris; F/O. H. O. Hetterley; Sgt. A. V. Hipkiss; Sgt. I. Holbrook; Act. Flt. Lt. J. Hough, D.F.C.; Sgt. V. S. Hughes; Sgt. R. McK. Innes; Sgt. D. O. Jones; Sgt. K. Jones; Sgt. P. S. Lowry; P/O. J. G. McComb; F/O. D. MacDonald; Sgt. N. MacKay; F/O. C. P. McManus; Flt. Sgt. N. J. Martin; Flt. Sgt. E. V. Matthews; Sgt. K. Mellor; F/O. A. P. S. Milligan; F/O. F. H. Moyniham; P/O. J. C. Otter, D.F.M.; Flt. Sgt. S. Owen; Flt. Sgt. F. A. G. Parker; Sgt. B. C. Paul; F/O. B. K. Petyt; Sgt. L. Pezaro; Sgt. K. D. Pitman; Flt. Sgt. J. G. Potter; F/O. J. W. Potts; Sgt. W. Riddell; Act. Flt. Lt. R. Roberts, D.F.C.; Sgt. T. G. Roberts; Sgt. E. A. Robinson; Sgt. A. E. Rosen; Sgt. T. B. Semple; Sgt. G. V. Sharratt; P/O. N. R. Shaw; Sgt. J. K. Shipp; P/O. D. M. C. Silverman, D.F.M.; Sgt. L. T. Smith; P/O. H. S. Spain; Sgt. A. B. Springett; F/O. G. D. Spyers; Sgt. J. Stobo; P/O. M. J. E. Stoneley, D.F.M.; Sgt. W. G. Stratham; Sgt. J. Sykes; Act. Flt. Lt. E. M. Thompson, D.F.C.; Sgt. T. Thomson; Flt. Sgt. T. J. P. Walsh; Sgt. J. Warhurst; Act. Wing Cdr. J. H. White, D.F.C.; Sgt. J. E. Whitehead; F/O. N. V. Whiteman; P/O. T. B. Wilkin; P/O. W. Wilkinson, D.F.C.; F/O. S. Willetts; Sgt. A. F. Williamson; Sgt. F. G. Williamson; Sgt. F. J. Wooldridge.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. W. E. Fern.

KILLED ON ACTIVE SERVICE.—Sgt. J. W. Baas; Sgt. E. R. Barnes; Flt. Sgt. W. Barraclough; L.A/C. J. A. Frith; Sgt. H. P. G. Harbour; Sgt. J. B. Hayton; Sgt. R. S. Jackson; Sgt. P. C. Lockyear; Sgt. M. Mouncey; Sgt. G. E. Murray; P/O. H. A. Strange; Sgt. I. St. C. Sutherland.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. D. G. Leverton.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. A. C. Cocks; A/C.2 A. J. Durston; Sgt. R. A. Partridge.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. R. H. Myers.

DIED ON ACTIVE SERVICE.—L.A/C. J. Allibone; A/C.1 T. F. Bamkin; A/C.2 L. C. G. Brown; A/C.2 W. J. Dougherty; A/C.1 J. G. Durdey; W/O. E. A. Hancock; L.A/C. F. A. Janes; A/C.1 E. H. King; A/C.1 J. H. Kitts; A/C.2 P. J. McIlroy; L.A/C. D. J. Oliver; L.A/C. F. Peace; Act. Sqn Ldr. J. N. Roach; L.A/C. C. W. Robins; A/C.1 F. G. Shore; L.A/C. J. Walker; Wing Cdr. R. Wilson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. H. L. Ashley; Sgt. H. Edwards; Flt. Sgt. E. W. Evans; Sgt. R. H. Fisher; Sgt. S. F. Hathaway; Sgt. D. I. Morris; Sgt. S. Trevvett; Sgt. L. C. Wood.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 J. C. Berks; L.A/CW. M. R. Cuthbertson; S/O M. M. Daventry; A/CW.2 M. B. Harvey; A/CW.2 L. Woodward.

Royal Australian Air Force

KILLED IN ACTION.—F/O. A. W. F. BAIL[illegible];

SERVICE

Flt. Sgt. W. W. N. Knights; Sgt. K. J. Peterson; Flt. Sgt. D. T. Walsh.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. F. B. Gillan.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. F. C. Callander; Flt. Lt. C. C. Clark; Sgt. L. J. Lang.

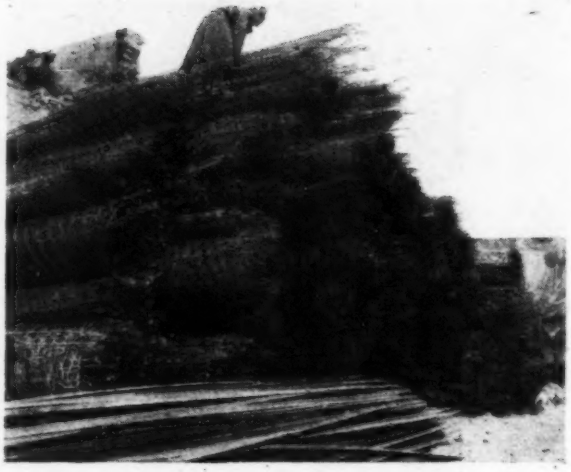
MISSING.—F/O. K. E. Adamson; Flt. Sgt. H. F. Altus; Flt. Sgt. J. R. Forbes; Flt. Sgt. J. G. Gibson; Flt. Sgt. A. M. Kearney; Flt. Sgt. J. D. Malcolm;; Flt. Sgt. W. W. J. Manning; Flt. Sgt. G. E. Marland; Flt. Sgt. R. H. Matheson; Flt. Sgt. J. A. McC. Murray; P/O. R. E. Peate; Flt. Sgt. F. L. W. Pritchard; Flt. Sgt. A. R. Singie; F/O. C. G. Slennett; Flt. Sgt. R. J. Thomson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. C. T. G. Coward.

KILLED ON ACTIVE SERVICE.—F/O. F. A. Connell; F/O. J. R. Keane; Flt. Sgt. F. J. Oakley.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. N. F. D. McCallum; Flt. Sgt. W. M. Mullins

DIED ON ACTIVE SERVICE.—Cpl. H. Freeman.



To combat Italian rains. Heaps of Sommerfeld wire runways at a Mediterranean depot. The winter rains have turned the hard earth runways of the summer into quagmires.

AVIATION

KILLED ON ACTIVE SERVICE.—Sgt. R. Crookes; Sgt. J. D. Hall; Flt. Sgt. D. Norton; Sgt. G. A. R. Rathbone.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.1 G. A. Jacques; A/C.2 R. R. Mason; F/O. N. J. Miller; L.A/C. L. J. Rogers; Sgt. E. D. Shepherd; L.A/C. B. Woodvine.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. P. G. Spencer.

DIED ON ACTIVE SERVICE.—A/C.1 C. Anderson; L.A/C. H. Bannatyne; L.A/C. S. Blackwell; A/C.2 J. Brown; A/C.2 F. J. Byrnes; A/C.1 O. R. E. Dorman; L.A/C. H. Finlayson; L.A/C. N. Fletcher; Sgt. S. H. Goodworth; L.A/C. K. W. Harris; L.A/C. A. Irvine; L.A/C. J. Jamieson; A/C.1 H. L. Lawrence; L.A/C. J. Robertson; Wing Cdr. L. T. Sanderson, D.S.M.; L.A/C. D. P. Simmonds; L.A/C. G. Walker; A/C.1 R. E. Wilkins; A/C.1 T. W. Wrightham.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. W. P. Banks; Flt. Lt. W. W. Dyer; Sqn. Ldr. L. H. Folkard; Flt. Sgt. R. L. Hooper; Sgt. G. A. Jones; Sgt. A. R. Kidley.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. W. W. Coons; Flt. Sgt. W. V. Crockett; Sqn. Ldr. E. A. Good; Sgt. C. E. McGillivray; W/O. D. A. Payton.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. W. Reynolds; Flt. Sgt. J. D. Steele.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. J. C. Arpin; Sgt. W. G. Francis; Sgt. J. Kowalski; Flt. Sgt. M. P. Myers.

MISSING, BELIEVED KILLED IN ACTION.—F/O. D. H. Petch; Flt. Sgt. A. L. Sedgwick; Flt. Sgt. K. C. Smith.

MISSING.—Sgt. D. G. Addison; Flt. Sgt. S. A. Anderson; F/O. G. O. Carefoot; Sgt. E. E. Case; Sgt. R. Dixon; Flt. Sgt. J. P. H. Dube; Flt. Sgt. S. G. Erickson; Sgt. K. A. Farmer; F/O. E. D. Fogg; Sgt. A. F. Gander; Sgt. W. J. Gerow; Sgt. W. C. Gilchrist; P/O. G. A. Graham; Flt. Lt. A. C. Harding, D.F.C.; Flt. Sgt. G. P. Herman; Flt. Sgt. P. G. Jolliffe; F/O. P. Kennedy; P/O. R. H. Larson; Sgt. D. J. MacDonald; F/O. G. L. McLaughlin; Sgt. R. K. Megit; W/O. E. G. Millidge; P/O. R. D. Mutch; Sgt. M. L. Nesvold; Flt. Sgt. W. J. M. Nickerson; Flt. Sgt. G. J. Partridge; P/O. M. L. Richardson; Sgt. A. E. Roden; F/O. J. S. Smith; Sgt. E. F. Uren; F/O. F. W. Winter.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—P/O. R. F. Ready.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. K. Grainger; P/O. K. H. G. Groves; P/O. W. J. Hough; P/O. D. G. McCaskill; Sgt. R. A. Smith; Sgt. R. C. Stone; Sgt. H. N. Wade.

MISSING.—Flt. Sgt. A. G. Bernard; F/O. H. M. Mackay; Flt. Sgt. J. E. S. Margetts; Sgt. E. R. Whittington.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. F. Simpson.

KILLED ON ACTIVE SERVICE.—F/O. W. J. Dodds; Flt. Sgt. A. G. Gibbison; F/O. R. M. Grant; Flt. Sgt. I. E. Mathieson; F/O. H. W. Meldrum.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. F. A. Brittain.

South African Air Force

KILLED ON ACTIVE SERVICE.—Lt. W. F. B. Standon.

Casualty Communiqué No. 340.

Of the names in this list 92 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. L. Bennett; Sgt. S. Elder; Sgt. F. J. Fletcher; Flt. Sgt. E. B. Gosden; Flt. Sgt. C. C. Lineham; Sgt. R. Lloyd; Sgt. C. F. Martin; Sgt. R. G. May; Sgt. F. W. Thompson; Sgt. W. G. Thomson; Sgt. J. Welsh; Sgt. A. D. West.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. C. W. Akeister; Sgt. C. E. Bradbury; Sgt. J. L. Cartmell; F/O. H. E. Clement; Sgt. W. E. S. Cooke; Sgt. R. B. Cooper; Sgt. J. A. Clough; Sgt. G. W. Graham; Sgt. R. G. Hamilton; Sgt. L. R. Hannaford; F/O. S. W. Lovett; Sgt. F. Moody; Sgt. G. W. H. Northover; Sgt. J. Osborne; Sgt. A. Ottolangui; F/O. F. M. Richards; Sgt. E. Smith; Sgt. P. D. Steed; Sgt. V. Sugden; F/O. D. I. Vize; Sgt. R. A. Waterhouse; Sgt. F. Wood; Sgt. G. C. A. Zedy.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. K. C. C. Adams; Sgt. E. W. Aldridge; F/O. J. R. Armstrong; Sgt. R. W. Barker; Sgt. E. S. Bowen; Sgt. A. B. Boyd; Sgt. S. Brenner; P/O. H. Broadbent; Flt. Sgt. R. Brough; Sgt. J. A. Brown; Sgt. R. Brown; F/O. D. A. Bruce; Sgt. W. Carter; P/O. H. Catch; P/O. L. J. Collins; P/O. L. J. Cursley; F/O. S. P. Davis; Sgt. S. F. Dean; Sgt. N. Douglas; Sgt. W. Duthie; Sgt. G. J. Good; Sgt. J. Greenway; Sgt. W. F. W. Hards; Wing Cdr. R. A. I. Harrison; Sgt. A. J. Hawkins; Sgt. R. E. J. Hunt; Sgt. A. S. Jones; Sgt. T. E. Jones; P/O. H. F. Lewis; Sgt. W. A. Lewis; Sgt. T. H. Luscombe; P/O. G. McVitty; Sgt. T. Mairs; Sgt. F. H. Martin; Flt. Sgt. E. B. Mellor; Sgt. G. R. Minns; Sgt. J. H. Mitchell; Sgt. W. Myerscough; F/O. F. Openshaw; Sgt. B. W. A. Perry; Sgt. K. Richards; Sgt. E. Rowlands; Sgt. J. H. Saville; Sgt. J. Stock; Sgt. A. N. Stonestreet; Sgt. L. L. Stuart; Sgt. F. I. Tillen; P/O. W. H. Walton; Sgt. M. Whitby.

WOUNDED OR INJURED IN ACTION.—Sgt. C. W. Pemberton.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Act. Flt. Lt. L. R. Cowling.

MISSING, BELIEVED KILLED IN ACTION.—F/O. R. E. Ault; Flt. Lt. N. H. Carfoot; P/O. W. J. Champion; Sgt. T. W. Davis; F/O. V. G. Deacon; Sgt. I. K. Doncaster; Sgt. R. W. Elder; Sgt. S. Grognet; Act. Flt. Lt. C. N. Hammond; Act. Flt. Lt. L. A. Harden; Sgt. G. E. Haskings; P/O. E. E. Jones; Sgt. G. Morrison; P/O. A. H. Petty; Sgt. S. A. Robbins; F/O. S. A. Swain; Sgt. R. D. Yates.

MISSING.—Sgt. J. A. Adams; Sgt. H. A. S. Addison; Act. Flt. Lt. L. J. Allum, D.F.M.; Flt. Lt. J. Bannon; F/O. A. Barker; Sgt. J. W. Barker; Sgt. C. W. Billett; Sgt. G. J. Blackman; Flt. Sgt. J. G. Blackwood; Flt. Sgt. E. H. Blanks; Sgt. A. A. Brandon; Sgt. D. G. G. Buckle; Sgt. C. Burton; Sgt. G. S. Camm; Flt. Sgt. F. L. Chapman; Sgt. J. F. M. Davies; Sgt. W. J. Davies; Sgt. N. W. Durrant; Sgt. T. Elliott; Sgt. J. P. Ferrier; Sgt. J. Forrest; Sgt. J. Haddow; Sgt. F. W. Haris; Flt. Lt. A. R. Head, A.F.C.; Sgt. C. H. Hollingsworth; Sgt. J. E. W. Iverson; Flt. Sgt. C. A. James; Sgt. L. James; Flt. Sgt. W. N. Kinsey; Sgt. L. J. Lewis; Sgt. R. Littlehales; Sgt. R. W. Longley; Sgt. T. McGloin; F/O. R. C. Mair; F/O. G. W. Marshall; Sgt. W. H. Marson; P/O. W. L. Martin; Sgt. R. MacL. More; Act. Flt. Lt. G. J. B. Neil; Act. Son. Ldr. E. H. M. Nesbitt; Sgt. C. O'Connor; Flt. Sgt. F. R. Page; P/O. W. G. S. Pagett; Flt. Sgt. B. H. Papworth; Sgt. D. M. Pearson; Sgt. J. H. Pepper; Act. Flt. Lt. J. Perfect; Sgt. W. E. Pyne; F/O. D. E. Reay; Sgt. J. Richardson; Flt. Lt. A. Seymour; Sgt. W. R. Shore-Marston; Sgt. R. Skelton; Sgt. G. W. Smith; Sgt. A. Spurr; Sgt. A. J. Stanton; Sgt. A. E. G. Thomas; Sgt. J. E. Thomas; Sgt. R. Thorn; Sgt. W. J. Ward; Sgt. F. A. Watkins; Sgt. A. D. West; Sgt. G. White; Flt. Sgt. A. J. C. Williams; Sgt. J. L. Williams; Act. Flt. Sgt. W. M. Wilson; Sgt. H. L. Wood; Wing Cdr. C. L. Y. Wright.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. M. A. Macfarlane; Flt. Sgt. K. N. Windus.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. B. M. T. Davis; Sgt. K. D. Dyce; P/O. I. C. MacKenzie; Flt. Sgt. C. S. Wright.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. B. Bayliss; Flt. Sgt. J. S. U. Biffen; Sgt. B. F. K. Green; Flt. Sgt. R. E. Wilson.

MISSING.—Sgt. B. Aberle; F/O. R. C. Behrindt; F/O. G. R. Brooker; Flt. Sgt. A. T. Brooking; Flt. Sgt. R. Brown; Flt. Sgt. W. T. Burge; Sgt. K. Coghill; F/O. N. H. Craig; P/O. D. A. Crookston; F/O. A. F. Davis; Flt. Sgt. J. W. Fowler; P/O. M. J. Freeman; P/O. C. Furzer; F/O. A. G. Hartwig; Flt. Sgt. R. M. Henderson; W/O. H. J. Hicks; Sgt. J. T. R. Jones; Sgt. H. E. Knights; Flt. Sgt. C. H. S. Leggo; Flt. Sgt. D. Louthean; Flt. Sgt. J. W. Muntz; Flt. Sgt. W. T. Sherwin; Sgt. P. Stanton.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. H. Mellersh.

KILLED ON ACTIVE SERVICE.—Sgt. A. F. Bell; Flt. Sgt. F. W. Cummings; F/O. G. H. Davidson; Flt. Sgt. J. B. Timperon.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. J. Hogan; Sgt. D. Russell.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. A. E. Evers; F/O. A. V. Gloor; Sgt. R. G. Patterson.

DIED ON ACTIVE SERVICE.—Sgt. L. Buswell.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. R. S. Gidley; F/O. L. J. Netherway; Sgt. C. M. Ryan.

Royal Canadian Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. D. E. Hicks; Sgt. V. T. Hooper; Flt. Sgt. S. W. Lucyk; Sgt. J. McG. Smith.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. H. A. Brown; Flt. Lt. A. E. Hannah.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. R. E. Milliken.

WOUNDED OR INJURED IN ACTION.—W/O. C. F. Laloli.

MISSING.—Flt. Sgt. J. L. Cowie; Flt. Sgt. E. W. D. Hunt; F/O. S. H. MacKenzie; Flt. Sgt. G. W. Tindle; Flt. Sgt. J. C. Turner.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. I. T. Walker.

South African Air Force

KILLED ON ACTIVE SERVICE.—Lt. H. J. E. Senekal.

Official Corrections

Casualty Communiqué No. 338.

Under "MISSING" delete Sgt. N. Hall, F/O. C. G. S. Hodgkinson, Sgt. R. Jefcoat, Sgt. G. W. Leverington, and Sgt. J. Pottinger.